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Electrical Development Propaganda.

AT the present moment when, we presume, the plans of the British Electrical Development Association for intenser operations are in course of preparation, it may be profitable to draw attention to the very big electrical propaganda effort that commenced in the United States in the month of September. It is described by the *Electrical World* as a "nation-wide plan," launched by many electric light and power companies, assisted by the National Electric Light Association, to "carry the central station industry's story to the public." Every month during the coming year consumers of electrical energy will receive a four-page pamphlet explaining certain important features of the industry. "Envelope-stuffers" of approved form will carry messages with every consumer's account and with every electricity supply shareholder's dividend coupons. Down to the middle of August five million of the "envelope-stuffers" had been ordered and 500,000 sets of a series of pamphlets—indeed, under the scheme, 67,000,000 separate messages will be placed in the hands of customers and stockholders during the twelve months ending with August, 1926. We can quite believe that the claim that this is the largest single piece of publicity work ever undertaken by any industry, is correct, and it is safe to agree that it promises to be of inestimable value to the electrical industry in clarifying some questions which are obscure to the public mind, for the closer the relations existing between electrical organisations and the public whom they serve the better it will be for both.

The questions discussed in the American pamphlets and folders are not such as we are in the habit of seeing dealt with in our electricity supply publicity literature, in which are set forth the advantages of electrical service in the home, or particulars of cooking appliances, electric fires, washing machines, &c., or reasons why everybody should make better and more generous use of electricity as an illuminating agent. The kind of information given in this particular propaganda movement may be indicated by a reference to one example entitled "Yes! Grape-fruit is cheap in Florida." The suggestion that one could run down to Florida and get a grape-fruit for nothing is met with the retort: "That's a good idea; the car-fare is only $57.16," the thought

carried home being that while it costs only 20 per cent. of electricity's selling price to manufacture it, it requires 80 per cent. for delivery cost, taxes, interest on investment, and service; another fact driven home at the same time being that, while the average cost of all other commodities has gone up 65 per cent. since 1913, the electric light and power industry has actually lowered the cost of its commodity during the same period; a third thought that emerges is that "it is better for Government to govern and let business be run by business men." One pamphlet bears a title which excites the interest of people who have been led to think on the subject of generation at the pit's mouth: "Why not generate all electricity at the coalmine?" Another title asks: "Why did 860 municipally-owned plants close down?" and so on. The folders for stockholders are entitled: "What is a Holding Company?"; "What is Super-power?"; "What About Service at Cost?"; and "If All the Streams were Harnessed."

These educational efforts make it plain to the "common people" that, while electricity is a magic thing, "very stimulating to the imaginations of orators and self-appointed friends of the people," "it is the business men who have built up the electrical industry," and they are not "overlooking any bright ideas," but "are alive to every possibility of reducing costs and improving service."

It will be recognised that extensive as the foregoing scheme is, it is only part of the larger educational and general electrical development campaign that has been in progress in the United States, at enormous outlay compared with what is spent here, for some years past. Prognostications respecting the rate of electrical development during the next five or ten years across the Atlantic produce a huge total in additional capital outlay for the electrical industry and in revenue for supply companies and investors. True it is that the field there is much bigger than that in which we operate here, but the leeway to be made up and the great headway that we are justified in anticipating during the same period should together give us a larger rate of advance with advantage to every section of the electrical trade and with benefit to the community. If only the industry, with its 500 or 600 millions of capital invested would take an enterprising plunge suited to its ability and its opportunity, electrical ignorance among millions of dwellers in the British Isles would be dispelled, interest would be aroused, electrical service would rapidly extend, and a continuously progressive and larger return would come far sooner than it is likely to do if we continue to be satisfied with a little activity where much is justified.

Analysing the Domestic Budget.

AFTER analysing the sales of electricity and electrical appliances to wired houses in about 60 representative towns in the United States, *Electrical Merchandising* comes to the conclusion that the American public does not yet take its electrical expenditure very seriously. It was found that electricity for home use accounted for an expenditure of $30 per annum for each wired home, while the expenditure upon appliances was $10.88. To indicate the low plane upon which electricity finds itself, our contemporary goes into further details of domestic expenditure, and finds that each family spends an average of $420 per year upon automobiles and supplies; $236 upon women's clothing; $100 upon tobacco; $60 upon theatres and "movies"; $25 upon "radio"; and a great deal on other non-essentials, while electricity is well at the bottom of the list.

We do not know how the figures are arrived at, but they have made us wonder what a similar analysis of British domestic expenditure would look like. While, no doubt, taxation would figure very largely, we are quite certain that electricity would still be at the bottom—in fact it would only just come into the list. If Americans consider that there is such a wide scope for electrical expansion in their country, what are the conditions in Great Britain?

The analysis makes it apparent that a great deal remains to be done in the way of educating the American public to the benefits of electricity, and it can be taken for granted, if any further indication is needed, that there is still greater room for development in this country.

The Trade Facilities Acts.

THE statements of proceedings under the Trade Facilities Acts, issued by the Treasury, have certain points of interest for our readers, both manufacturing and electricity supply. The interest to electrical manufacturers lies in the big proportion of loans which have been devoted to electrical enterprise and which should give a corresponding stimulus to business. Certainly over, say, £20,000,000 appears to be allocated thus. Then as to the electricity supply industry, one interest may lie in the fact that with the extended provision in the Act of 1925, the Advisory Committee has a balance unallotted of £15,547,064 (according to the figures of the last Treasury statement), so there is still room to entertain further applications. It is perhaps a little surprising that the industry has made so little use of the Acts, seeing that out of the 225 supply companies, the majority of which are small companies, only 14 appear in the lists. The nature of a supply company entails a constant capital expenditure, and probably three-quarters of the companies in the country have to depend on local or individual capital, making the question frequently an anxious one. One would have anticipated, therefore, that from an industry of this kind there would have been almost shoals of applications. One thing, possibly, may have militated against the making use of these guarantees, namely, the fact that the difficulties of capitalisation in the past have sometimes involved companies in complicated finance which precludes their giving a first charge or something equivalent as security as required by the Advisory Committee. Still, in the case of public utility companies, the Advisory Committee may possibly be coaxed into a little elasticity of procedure where the loans are required for sound and remunerative extensions of operation. We see that the North Wales Electric Power Co. has taken up a loan of £1,700,000 to cover its programme of exercising the operating powers of the Joint Electricity Authority constituted for the North Wales and South Cheshire Electricity District. It is for part of a similar programme for the South-West Midlands Electricity District scheme that the Shropshire Power Co. has also received a loan of £700,000. Now that further of these reorganisation schemes are ripening into action it may be that similar assistance will be solicited. Anyhow, the existence of such provision of capital ought to give a fillip to the spirit of enterprise in electricity supply companies, both singly and co-operatively.

Electrical Trade Abuses.

A "MASS MEETING" of Manchester district electrical contractors, manufacturers and wholesalers has been summoned for 2 p.m. on Monday next at the Rooms of the Manchester, Salford and District Building Trades Employers' Association, 10, South Parade (St. Mary's Parsonage), Manchester.

The object of the meeting is further to consider a report which has been prepared by the sub-committee and the main committee after a long series of meetings held to inquire into certain well-known abuses in the trade—particularly in their local application—and if possible to bring about better conditions of trading generally. The first meeting of representatives of manufacturers, wholesalers and contractors took place a year ago. It was very well attended, and whilst recognising that the three sections of the trade had their own organisations and that a national policy was preferable to a parochial one, it was felt that if local representatives of the three sections of the trade could meet together, a better and more harmonious condition of things might be brought about, and that suggestions

emanating from such an important section of the industry as was contained in the Manchester and district area would be of more than local benefit. A committee consisting of six representatives of each of the three sections was appointed, but eventually the matter was referred to a sub-committee of six gentlemen, and it is the report of these six that will come under consideration at Monday's mass meeting.

The Engineering Industry and Over-Capitalisation.

At the recent meetings of the Trade Union Congress references were made to the subject of over-capitalisation in industry. In this connection it is useful to recall that early in the present year this matter was dealt with in a special Memorandum by Mr. D. A. Bremner, Director of the British Engineers' Association, submitted to the Balfour Committee on Trade and Industry. This statement was briefly alluded to in our issue of April 17th, 1925 (p. 614), but those who are interested in the recent discussions would do well to study the particulars set forth in the B.E.A. summary of its investigation where watered capital, over-capitalisation, and bonus share distributions came under discussion. An analysis was given showing the relation of these financial operations to some 31 companies connected with the engineering trades, and the result of the investigation was to show that the engineering industry was exceptionally free from watered capital and that the chief cause of over-capitalisation had been the slump in capital values consequent upon the fall in price levels since the post-Armistice boom. This cause, it was held, had probably had more than an average incidence on the British engineering and metal industries. The Memorandum added that there were no grounds for attributing the state of the engineering industry to unsound financial policy; the chief causes of the depression were held to be our high costs of production and distribution and the under-consumption of our export markets.

The Austrian Electrical Industry.

It is stated that, apart from the orders given in connection with the electrification of the federal railways and the construction of hydro-electric works, the situation of the Austrian heavy electrical engineering industry in general is not favourable. In the lead cable branch some revival has taken place, as the postal authorities have placed orders for one-half of the telephone cables which are required for the line between Vienna and Passau, the first long-distance line in Austria, and one which will connect with the German network at Passau. Business in insulated conductors and windings is reported flat, and the wireless apparatus branch is also depressed, although a revival is expected in the near future. The other branches of the electrical industry likewise are suffering from the general economic crisis. The treaty of commerce with Jugo-Slavia has been the means of effecting some reductions in the Customs tariff, although the duties are still higher than before the introduction of the new tariff. Business with Poland labours under the difficulty of the depreciation of the zloty, while the absence of a treaty of commerce with Hungary has a disturbing effect on exports as the autonomous Hungarian tariff almost completely prevents the importation of electrical products into that country.

Public Lighting.

The Institution of Public Lighting Engineers held a very successful conference at Leeds last week—the second annual meeting—and may be regarded as fairly launched on its career of usefulness. Like the Illuminating Engineering Society, it brings electrical and gas engineers together for the discussion of their common objects and in friendly rivalry; and whilst we do not regard with favour the multiplication of specialist societies whose functions can be efficiently performed under the ægis of existing organisations, the test of survival cannot be gainsaid—if a new society is not needed, it will perish of inanition. It would appear, therefore, that the Institution fills a want.

That the subject with which it deals is very much alive may be inferred from the fact that during the last year or two great improvements have been effected in street lighting apparatus, and the author of one of the papers remarked that since it was written progress had been made which already necessitated notable modifications in his conclusions. The new president, Mr. C. S. Shapley, in his inaugural address, observed that he had been disappointed with the results of "directional beam lighting" in one of the main thoroughfares of Leeds, and that it was sometimes advantageous in street lighting to sacrifice illumination for effect; moreover, he thought the horizontal illumination test did not give a true measure of the available illumination. There is a great deal more in these remarks than might appear at first sight. When one is dealing with purely physical problems the teachings of science can be applied with confidence; for instance, the energy required to maintain an electric lamp at normal incandescence for a known period can be predetermined with a high degree of accuracy. But the moment we go from physics to physiology precision ceases to have a meaning. The main purpose of street lighting is to enable the human eye to function after sunset, and whilst the degree of illumination produced can be defined in various ways, and measured in accordance with those definitions, the final criterion not of its efficiency but of its efficacy must necessarily be the effect produced upon the human organism, which is incapable of measurement. As an example of the inadequacy of ordinary scientific methods in such cases we may cite the experience of a speaker at the conference, who said that at a well-lighted and important crossing a policeman in white clothing was nearly knocked down by motor-cars on several occasions; it was found that he was safer in his blue uniform. Evidently there is a great deal yet to be learnt about public lighting.

The Development of Electricity Supply.

Opening an extension of the Keighley electricity works last Saturday, Mr. Philip Snowden once more expressed his views on the subject of electricity supply. We are sorry to learn that he thought the industry was still in its infancy—when will that pernicious phrase be dropped?—but we may forgive him the platitude in view of his robust and well-grounded faith in its triumphant future. The age of steam, he said, had left us a legacy of social problems; he looked to electricity to spread our population over the country, with immense benefit to the community. He rightly attributed the delay in electrical development mainly to the parochial policy followed in the past, and advocated legislation "on an ambitious scale," supplemented by State financial aid.

As a general rule, it is pretty safe to say that any remedy proposed by a politician for a social or industrial disorder is more likely to be one of the many wrong cures than the right one. Here we have Mr. Snowden recommending a larger dose of the same kind of medicine that stunted the growth of electricity supply when it really was in its cradle—legislation—and sugaring the pill with "a large expenditure of public money," another favourite nostrum of the professional politician. There are many members of the electrical industry who believe that its chief need is to be free from interference and to be permitted to develop on its own sound lines; that the only legislation that is likely to be of benefit is the repeal of the past legislative errors, but, unfortunately, the mischief that has been done cannot so easily be undone. If legislation there must be, let it be directed to removing the obstacles that have been built up, and smoothing the path of development. Electricity is no hot-house plant needing artificial coddling; neither is it the panacea for all social evils that it is represented to be by Mr. Snowden and other politicians. We are with him in the end to be attained, but we doubt the soundness of the means by which he would get there—*timeo Danaos*. . . .

High-Power Mercury Arc Rectifiers.

The Automatic Control of Sub-station Plant.

By R. L. MORRISON, A.M.I.E.E.

AUTOMATIC control, though still in its infancy, has made considerable strides during recent years, and to-day we find that a large proportion of the control of machinery installed in factories, workshops, &c., is more or less automatic. It is found that properly designed automatic apparatus with little supervision is not only more reliable in its functioning than hand control, but also is freer from breakdown and therefore more dependable.

A very large number of the low-pressure distribution systems at present in being utilise direct current which is supplied through the medium of rotating converters or mercury arc rectifiers. In the case of traction systems it is now generally conceded that this form of supply is the most suitable. Semi and fully automatic control of such converting plant has been very highly developed, the precise form of control being designed to suit local requirements. The more usual forms at present in use are:—

(*a*) Control by time switch.

(*b*) Control by predetermined line conditions, such as maximum and minimum pressure limits.

(*c*) Push-button control from a central point, which can be extended by the addition of signalling back arrangements to enable the control engineer to follow the sequence of operations.

By the use of a suitable selector switch and the provision of the necessary relays, it is possible to combine all the above methods of control in the one plant, or, on the other hand, to include any special requirements that may be desired to suit local circumstances. From this it will be understood that the provision of automatic features is to a large extent flexible, but naturally the precise requirements must be known when the design of such plant is undertaken.

In point of simplicity the automatic high-power mercury arc rectifier is unapproached by any other form of converter. The number of relays employed with the automatic rectifier is very considerably less than, for instance, with the automatic rotary converter, and those that are used are of the simplest possible character and have been tried out for a long period of years under the most exacting conditions. It is not proposed here to give a detailed description of the mercury arc rectifier and its functioning—a good deal of information has already been published in the past, and in particular reference should be made to the ELECTRICAL REVIEW, February 18th and 25th, 1921, and March 10th, 17th and 24th, 1922; also *Engineering*, October 19th and 26th, 1923. It is sufficient to indicate that the rectifier is a converter for statically transforming alternating into direct current, and as such presents many advantages when compared with the more usual systems employing rotating machinery.

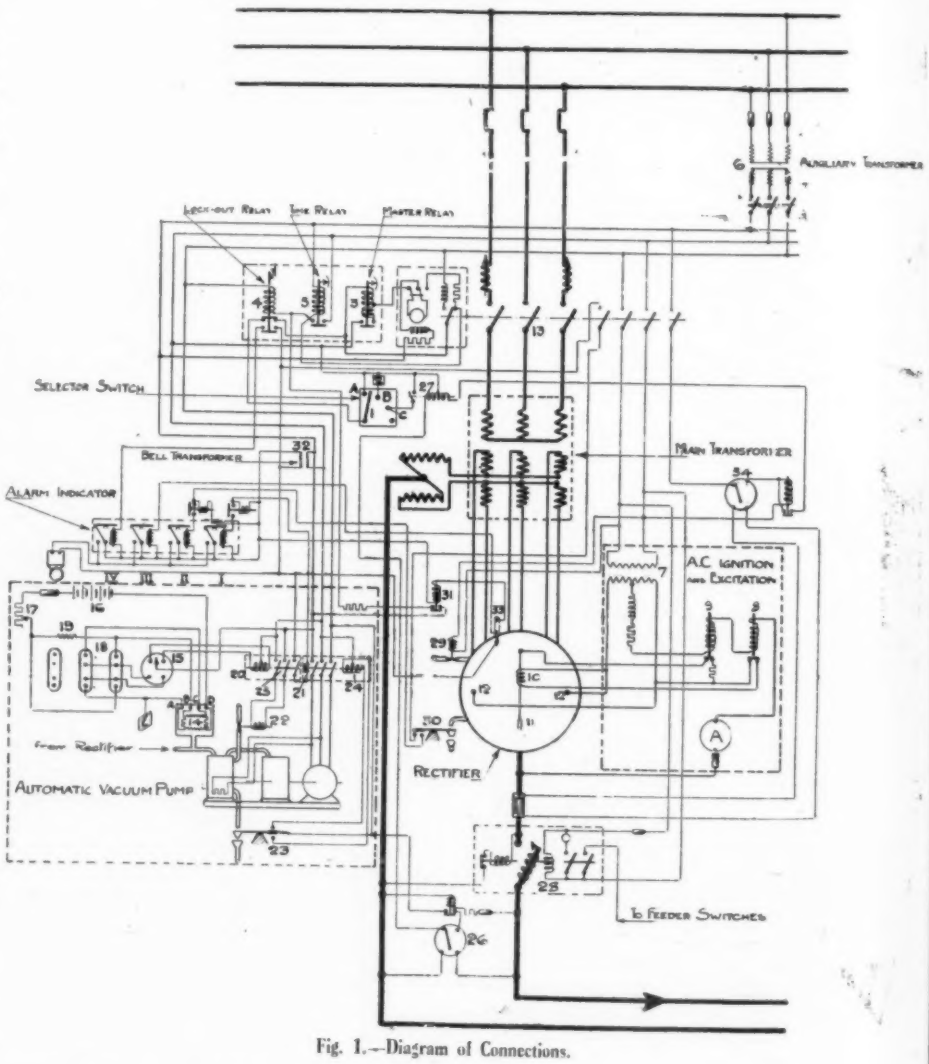


Fig. 1.—Diagram of Connections.

Rectifier equipment consists essentially of three parts:—

(1) A three/six-phase transformer of special construction connected on the primary side to the incoming h.p. supply and delivering its secondary six-phase current to

(2) the mercury arc rectifier, where the conversion takes place due to the valve action of the mercury arc when operating in a vacuum. The six-phase current received therefore at its anodes is delivered at the cathode in the form of a unidirectional current.

(3) The vacuum pump set which maintains the degree of vacuum necessary to the satisfactory operation of the plant.

Methods of Operation.

Reference has already been made to the different methods of operation that can be employed. All equipments may be considered to be fully automatic in the sense that every relay necessary for the operations of starting up and shutting down in all their stages is provided, and any special alternative or further methods of control that may be desired must be considered as additional to the automatic equipment in its simplest form.

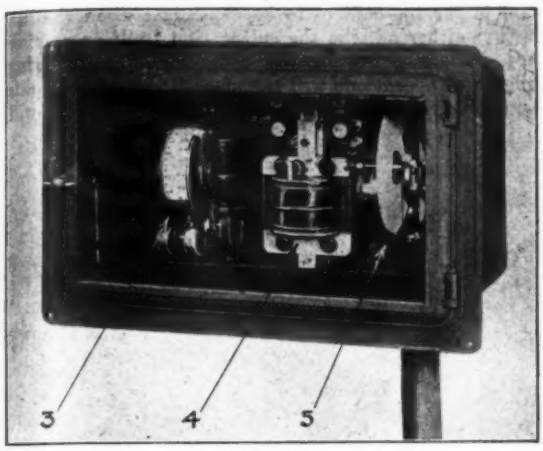


Fig. 2.—Main Relays.

Local conditions generally govern the particular method of control, and the diagram illustrated in fig. 1 shows three alternative forms. A selector switch 1 provides for direct control at sub-station (A), as a function of time (B), and as a function of line pressure and load (C).

The number of relays employed can be increased or decreased according to the degree of control desired. The diagram shown provides an average degree of control without unduly complicating the arrangement, but can be simplified if only one of the above methods is required.

Principal Relays.

The three main relays are embodied in one case, fig. 2, and consist of a master relay, 3, a lock-out relay, 4, and a time relay, 5.

The master relay is a slightly modified form of the well-known Brown, Boveri H-type time-limit overload relay, and controls the motor mechanism of the main h.p. switch. The lock-out relay is of the simple solenoid pattern which permanently shuts down the plant in the event of a continuance of abnormal circumstances, such as a permanent short circuit on the line. The time relay is also a well-known Brown, Boveri type, and operates in conjunction with the lock-out relay, the circuit of which it eventually completes. It is capable of adjustment over a wide range in order that the plant may trip out several times before being permanently locked out.

The few remaining relays are of extremely simple construction, and perform such minor duties that they need not be specially described.

The master relay has a time adjustment, and can be set to prevent the plant being unnecessarily put into service on the occurrence of momentary overloads on the system. On the other hand, where very rapid starting would be an advantage, the relay can be set accordingly and the plant be in service within a very few seconds.

Permanent Automatic Features.

There are two accessory portions of an automatically controlled rectifier equipment which can be considered apart from the rest, namely:—

(*a*) A.c. ignition and excitation which are permanently automatic irrespective of whether the rest of the plant is automatic or not, and

(*b*) The vacuum pump set which is constantly under pressure from the auxiliary transformer 6, and is therefore in a position to operate at any time, thereby maintaining in the rectifier the degree of vacuum necessary. This ensures the plant always being ready to be put on load at a moment's notice.

A.C. Ignition and Excitation.

Prior to the introduction of a.c. ignition the operation of striking the arc in the rectifier was performed with direct current supplied by a separate ½-kW converter. This introduced complications and was expensive, so that the new method of ignition is not only simpler but less costly. The operation of the circuit is as follows:—

When the main h.p. switch 13 closes, the ½-kVA excitation transformer 7 is switched in at the same time. This energises the coil 10 which pulls down the ignition anode 11. With the first positive half-wave or a following one of the same polarity, the arc is struck, and

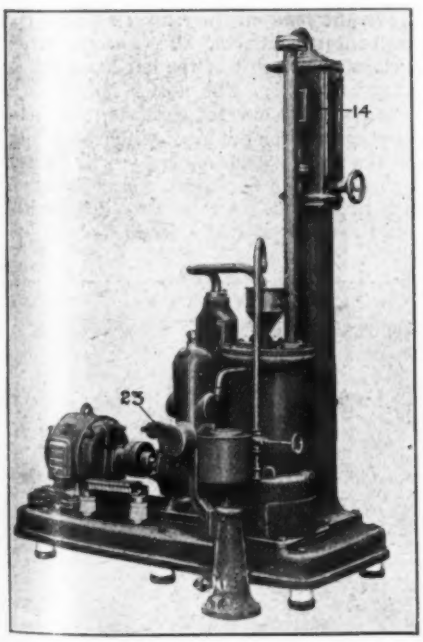


Fig. 3.—Vacuum Pump Set.

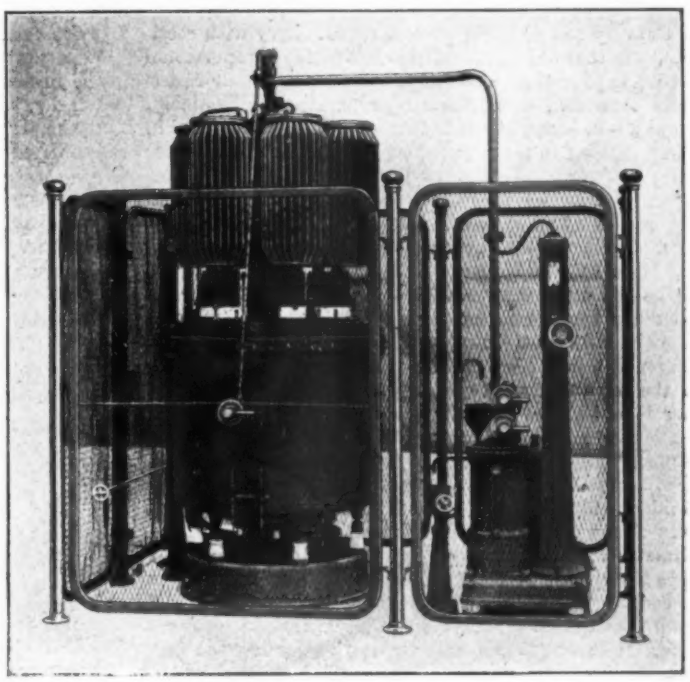


Fig. 4.—High Power Rectifier with Vacuum Pump and Screening.

relay 8 breaks its contacts and thereby de-energises coil 10. As there is pressure across the two excitation anodes 12, an arc is now started between these points and the cathode, causing relay 9 to function and the ignition circuit to be opened. The rectifier is now ready to be put on load.

Vacuum Pump Set.

The modified type of McLeod mercury gauge so well known in connection with these plants has been superseded by a direct-reading hot-wire vacuum gauge. The working principle is based upon the fact that the thermal conductivity of a gas depends upon the gas pressure.

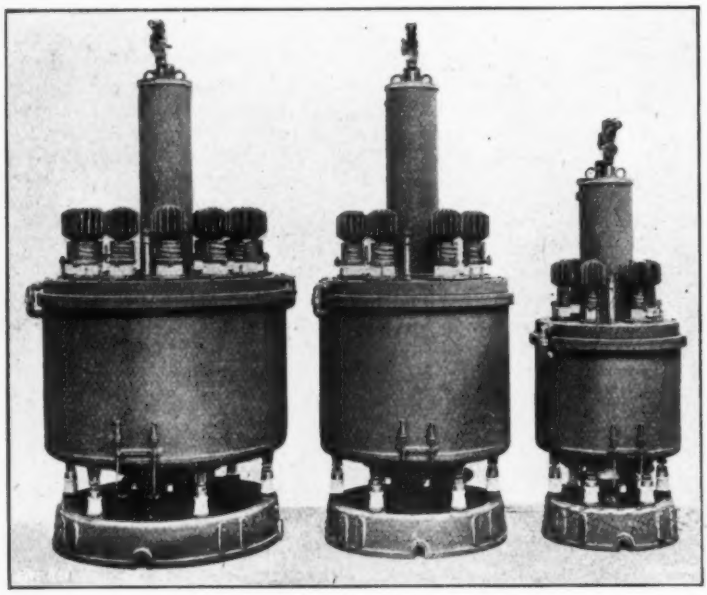


Fig. 5. High-Pressure Rectifiers.

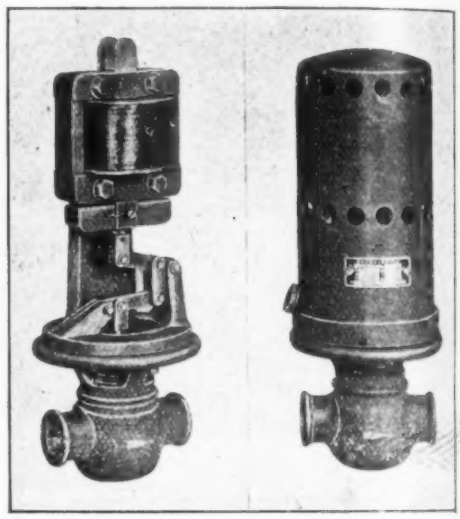


Fig. 6.—Electrically Operated Water Valve.

At the very low working pressures customary with rectifiers, the thermal conductivity is directly proportional to the gas pressure. The gauge 14 consists of four resistances connected as a Wheatstone bridge, two, namely, A D and B C, being in the vacuum, and two, A B and C D, being exposed to the atmosphere, the object of the latter being to compensate for any influence the external temperature may have on the accuracy of the readings. The resistances are electrically heated by means of a small battery 16, the current being adjusted by the rheostat 17 to 152 milliamperes. The branches A D and B C are heated in proportion to the vacuum, their ohmic resistance varying to the same extent, thus altering the potential difference between the points A and C, which difference is recorded on the voltmeter 15. To adjust for the correct current passing through the bridge, the plug is put into the right-hand contacts 18, which measures the drop across the shunt 19, in parallel with points B and D. The plug is then put into the middle set of contacts to record the potential difference across A and C, which is a measure of the vacuum in the rectifier. Through the medium of adjustable contacts on the voltmeter and the split coil 20, the switch 25 opens or closes the circuit of the water valve 22, thus controlling the cooling water supply to the stationary section of the pump. At the same time the tipping switch 23 operates switch 21 through split coil 24, and so connects or disconnects the pump motor. The complete vacuum pump set is shown in fig. 3.

The Operation of an Automatic Rectifier Equipment.

A high-power rectifier with vacuum pump set similar to that referred to in the diagram is shown in fig. 4. The rating of such a unit would depend upon the d.c. working pressure. Roughly, it would vary between 315 and 730 kW, the corresponding pressures being 300 to 750 volts. There are three further types manufactured, fig. 5, the ratings varying between 150 and 2,000 kW at pressures up to 1,800 volts. For higher d.c. pressures up to 6,000 volts the last three types are used, the current ratings in such circumstances being somewhat reduced. These outputs can, of course, be doubled by connecting two rectifiers to a single transformer of double the output.

As has already been explained, in the diagram three alternative methods of control are shown depending upon the position of the selector switch 1. The more usual is for the control to be dependent upon the line pressure either outside the sub-station itself or at some more remote point in the system. The following sequence of operations will therefore be based upon this assumption, and the position of the selector switch will therefore be "c." We will assume that the plant has been shut down; as the load on the network builds up, the needle of the contact voltmeter 26 connected across the d.c. supply closes the circuit of the left-hand coil of the small auxiliary switch 27. The master relay 3, now energised, bridges its heavy current contacts, thus running up the motor control for the h.p. switch 13, which puts pressure on the main transformer. It will be seen that the auxiliary switch for the exciting transformer 7 closes at the same time as the main switch—this ignites the arc and puts the excitation into operation, as has already been described. The rectifier is now under pressure on the d.c. side, and the circuit breaker 28 puts the plant on load through the operating coil connected across the d.c. supply. By coupling a small auxiliary

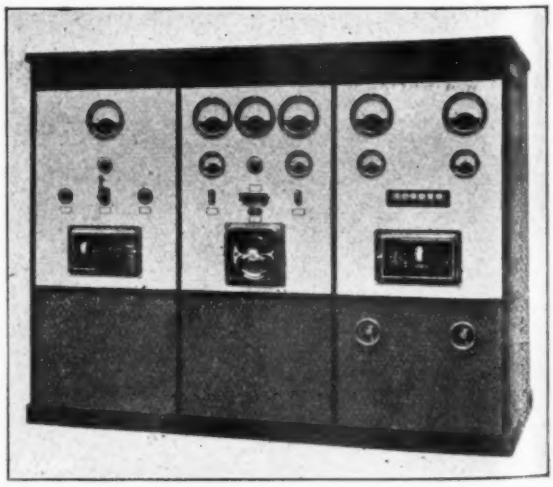


Fig. 7.—D.C. Switchboard for Automatically Controlled Rectifiers.

switch to the circuit breaker 28, the feeders can without difficulty be electrically operated.

To dissipate the heat generated in the rectifier, a small quantity of water is passed through the jacketing surrounding it. The flow of this water is controlled by the electrically-operated valve 29 shown in fig. 6, which opens when the plant is put under pressure on the a.c. side. In the event of the water supply failing when the plant is under load, the tipping switch 30 closes its contacts, drops the indicator II of the alarm device, and sets the bell ringing. Of course, the same operations would take place should the quantity of water be insufficient for the load being dealt with. The auxiliary supply for the alarm circuits is provided by the 8-V bell transformer 32. Should the water remain off for an appreciable time, the temperature of that remaining in the jacketing will rise until contact is made on the first point of the thermometer 35, which drops the indicator III. If the same conditions continue, the upper temperature limit is finally reached and contact made on the second point of the thermometer, thereby shutting the whole plant down through the medium of relay 31 which operates the lock-out relay 4. Indicator IV then drops, showing that the plant is permanently off load and cannot be re-started until the lock-out relay is re-set, which would not be possible until the water supply had been resumed and the temperature in the jacketing reduced below the maximum.

From what has already been said, it will be seen that the whole of the operations involved in the starting and subsequent running of automatic high-power rectifier equipment are exceedingly simple, and not in any way involved. The same simplicity is apparent when shutting down, the operation for the method under consideration being performed through the medium of the contact ammeter 34, which cuts the plant out on predetermined minimum conditions being reached.

In the case of large sub-stations requiring more than one rectifier equipment, the automatic features are no more complicated than those described. The various sets are in such circumstances so arranged that as the load increases beyond the capacity of the units on load, others are brought into service and *vice versa* shut down as the load again decreases. The functioning of the relays can be delayed to prevent switching-in where the load variations are only of a temporary character, such as may be expected on traction systems.

General.

The practice of centralising the control of automatic sub-stations is finding favour in certain quarters at the present time. Where the units consist of rotary or motor converters, signalling-back arrangements are provided to enable the engineer in charge to see at a glance that the various sections of the automatic apparatus are functioning correctly. This is mainly due to the multitude and complication of such apparatus, and also to the difficulties inherent to the automatic starting up of converters of that class. On the other hand, it can be very definitely stated that no such difficulties arise with the automatic high-power rectifier, and consequently signalling back to the same extent is unnecessary—in fact, the only indication that might be considered essential would be the load on the sub-station. For control from a central point the selector switch would be on contact "A," with pilot wire connection to the central point.

The automatic features are usually incorporated in neatly designed panels similar to those shown on fig. 7. In this particular case the equipment comprises, in addition, an automatically operated induction regulator for pressure control. The voltage regulator itself seen on the centre panel is of the Brown, Boveri pattern. Immediately above it are the panel mounted parts of the thermal vacuum gauge.

Though the present automatic features are of a simple character, it is likely that in the near future further developments will take place tending to greater simplification, and in that case the details will be published in due course.

Experience has amply demonstrated that the chief sphere of utility of the high-power rectifier is undoubtedly in the direction of conversion for traction and other similar fluctuating load conditions. To date, the capacity of high-power rectifiers installed or on order is well over 200,000 kW, of which fully 80 per cent. is for traction or kindred loads. This is accounted for by the fact that heavy fluctuations are handled just as easily as steady loads, and also that d.c. pressures up to 6,000 V can be obtained in single units. A typical chart of an average day's load on the Turin-Lanzo-Ceres Railway in Northern Italy is shown in fig. 8. This railway is served by an 800-kW power rectifier operating at 4,000 V d.c. The success obtained with the sixteen 1,200-kW 1,500-V equipments on the Midi Railway of France is too well known to need further comment. Furthermore, in various parts of the world several 1,500-V plants are in completely satisfactory operation, while recently the Dutch railway authorities, after careful investigation, decided to equip their sub-stations on the new electrified line between Amsterdam and Rotterdam with high-power rectifiers. Considerable progress has also been made in the United States of America, several units already being in operation, and others in course of construction.

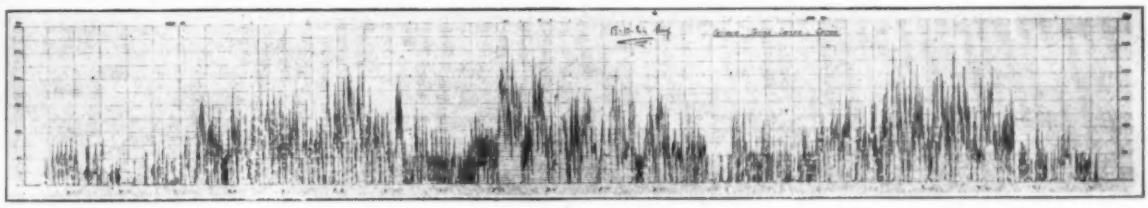


Fig. 8. Load Chart on Railway Operating at 4,000 Volts D.C.

Reliability and low maintenance charges are outstanding features of the modern high-power rectifier, especially when used for loads similar to those mainly referred to above. In addition, there is the high efficiency obtained with this class of plant especially at the higher d.c. pressures of 1,500 V and upwards. Due to the peculiar characteristic of the rectifier, the overall efficiency remains practically constant from full to quarter load; while the advantage at full load might not be considerable, at the lower loads it is very marked, and as the average load under traction conditions is usually something between a quarter and three-quarters load, a very material advantage is gained by the employment of rectifiers.

The future of high-pressure d.c. railway electrification will be decided largely on the question of satisfactory conversion, and it is the considered opinion of many intimately acquainted with the high-power rectifier that such decisions will depend very much upon its capacity for handling such conditions.

The author desires to thank Messrs. Brown, Boveri and Co. and his firm, Messrs. Power-Rectifiers, Ltd., for the facilities given and information placed at his disposal upon which this article has been based.

Water-Power Education in Switzerland.—Under the ægis of a number of Swiss technical and scientific bodies, and with the financial support of various cantons, arrangements are in hand for the establishment of a water-power utilisation experimental department at the Federal Technical High School of Zurich.

Electricity Supply in Nottingham and District.

The New North Wilford Power Station.

(*Concluded from page* 463.)

Only one alternator is earthed at one time, and the opening of the main oil switch of that machine automatically breaks the earth connection. A red lamp is mounted on the control panel of each alternator, and serves as an indication to the attendant as to which alternator is earthed. Should the earth connection be broken by the opening of the alternator switch, the attendant can earth any other running alternator by closing a control switch. Closing the earthing control switch of any standing alternator, or of one not switched on to the bus-bars, cannot earth that machine. Balanced protection is used on each alternator circuit, with compensated pilot wire protection on each feeder circuit. Excess pressure dischargers have been provided for each section of the switchgear. The extra-high-pressure auxiliary switchgear is built up in steel cubicles on the floor of the auxiliary plant bay. It controls the high-pressure side of the station transformers, and the switches are operated by hand. It is fed by two feeders, through special reactors, from one section of the main switchgear. Each turbo-generator is equipped with a separate synchroscope, which can be put in parallel with the synchronising instrument in the control room by means of a switch on the control panel for the particular machine in question. This is done when a machine is "run up" for paralleling, and the driver himself regulates the set into synchronism from the machine stop valve. The control of the machine governor is arranged from the control room. A system of signal telegraphs from the control room to the machines is installed, and also a load indicator to the boiler house; this is operated by hand to signal by illuminated signs the load on the station, and whether it is rising or falling.

The whole of the steam pipes are of steel, with steel flanges riveted on. They are laid with a continuous fall from the boiler stop valves to large separators at each turbine in the basement. The separators are drained by duplicate float traps, and the flow of the steam and of any condensed water is always in the same direction, up to these points. The atmospheric exhaust branches of the main turbines connect, through automatic valves, to a large steel exhaust tank in the basement of the feed pump annexe. This tank is drained, and a 30-in. atmospheric pipe is carried up above the roof of the annexe.

The bearings of the various turbines are lubricated, under pressure, by gear-driven pumps on each machine. The oil is pumped from settling tanks in the basement, and is returned after passing through duplicate oil coolers. The cooling water is taken from the main circulating system. New oil is brought to the station by railway, and is pumped, through filters, into a common oil storage tank, erected in a corner of the workshop building. The clean oil is pumped from the storage tank into the various turbine tanks, through a pipe line, so that no oil cans or barrels have to be carried into the turbine room.

Oil may be drawn off from any turbine tank, and be pumped up to a dirty-oil tank, erected above the filters. Thence it is passed through the filters into the clean-oil storage tank, where it is ready for filling or replenishing the oil supply of any turbine.

A workshop, 100 ft. long by 60 ft. wide, through which the railway track passes, is situated adjacent to the boiler house. A bay, 24 ft. wide, has been divided off from the workshop by an expanded metal partition, to form the main store-room of the station. Above the battery room a chemical laboratory has been equipped with all the apparatus necessary for coal, ash, oil, water, and other analyses and tests.

Offices, mess rooms, lavatories, bath rooms, &c., equipped with electric heating and cooking apparatus, have been provided for the station staff.

The foundation of the buildings has been constructed as a concrete raft, with concrete retaining walls. The basements of the turbine room and boiler house form a waterproof tank, up to a level above that of the highest recorded flood level. The building is largely a steel-framed structure; the walls are of brick with Derbyshire stone dressings, and the floors are of reinforced concrete. The elevations have been designed of as simple a character as possible, consistent with the size and use of the building. Fig. 16 shows a sectional elevation of the station, and fig. 17 shows the general layout of the plant, &c.

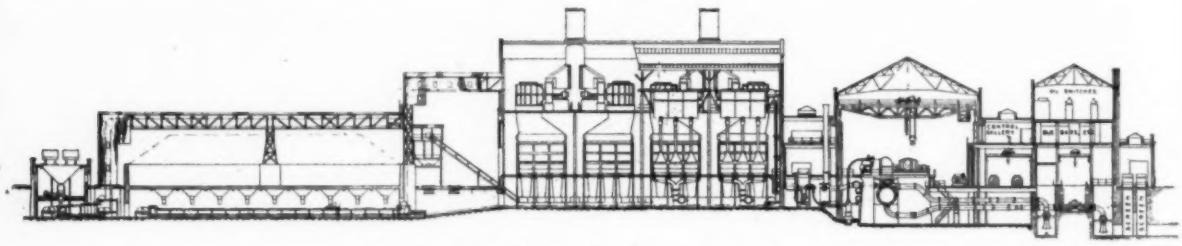


Fig. 16.—North Wilford Power Station: Sectional Elevation.

The roof of the oil-switch house is of fireproof construction. The other roofs are boarded and slated. Steel window frames are used throughout.

The interior of the turbine room is lined with glazed brick, up to a level of about 10 ft. above the floor line. Above the glazed brick lining, the walls have been treated with "Walpamur."

Foreseeing the rapid growth of the demand which will certainly arise, the Corporation has already authorised an extension of the station, by the addition of one 20,000-kW turbo-alternator, &c. This extension has been approved by the East Midlands Electricity Board, and confirmed by the Electricity Commissioners. The preliminary work is in hand, and installation will proceed immediately.

The transmission system has been laid and the sub-stations have been designed and equipped by Mr. H. Talbot, M.I.E.E., city electrical engineer. Energy is transmitted from the North Wilford power station at 11,000 V by underground cables to the Talbot Street and St. Ann's Well Road stations (to be used in the future as sub-stations) and to new sub-stations. Ten 0.2-sq. in., 3-core feeder cables have been laid from the power station to sub-stations at Wilford, Ruddington, Loughborough Road, Edwalton, The Park, Pierrepont Road, Holme Pierrepont, Radcliffe, Colwick, Carlton, City Asylum, Woodthorpe, Arnold, Radford, the University, Bullwell and Hucknall. A large proportion of the centre of the city is supplied with direct current, rotary converters being used for this purpose. Special

coupling transformers are erected at Talbot Street and St. Ann's Well Road to connect the 11,000-V supply from North Wilford to the 6,600-V system which had previously been supplied from the alternating-current plant at St. Ann's Well Road and the temporary power station. The whole of the outer portion of the area is and will be supplied with low-pressure, 3-phase, alternating current from a number of local sub-stations. Those which were originally fed at 6,600 volts will continue to be so fed, *via* Talbot Street and St. Ann's Well Road. Future sub-stations will be fed from North Wilford at 11,000 volts.. While the North Wilford power station has been erected primarily for supplying

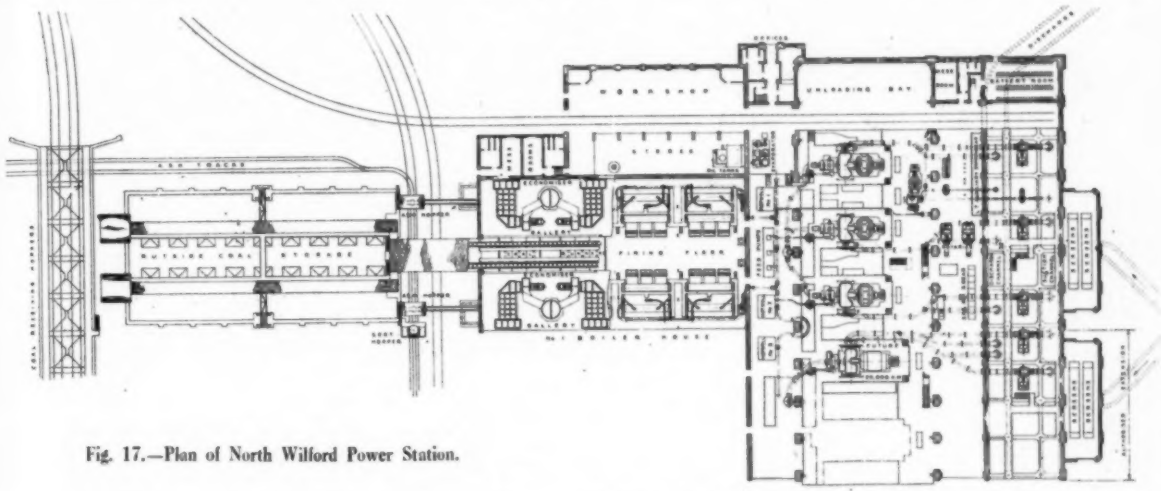


Fig. 17.—Plan of North Wilford Power Station.

the distribution area of the Nottingham Corporation, it has been designed so that it may be extended to deal with a working load of 200,000 kW should the necessity arise. The natural features of the site are such that the highest economy in generation will be possible, while its position, almost at the geographical centre of the East Midlands Electricity District, marks it as being the future source of the supply for that district, when the economical and physical limits of the existing power stations have been reached. Fig. 18 is a map of the area; the circles described about the station are of 5 miles increasing radii. The total area of supply is about 47 square miles.

The following is a brief *résumé* of the circumstances leading up to the erection of the new power station :—

The Corporation had been aware for a long time that its existing generating plant was out of date and uneconomical, and that the Talbot Street and St. Ann's Well Road sites were unsuitable for modern requirements. The question of the early provision of an up-to-date station was being fully considered in 1914, but the advent of the Great War effectively postponed for the time being all possibility of the provision of further generating facilities.

In 1918, upon the issue of the report of the Coal Conservation Committee of the Ministry of Reconstruction and the report of the Board of Trade Committee on Electricity Supply, the local authorities of Burton-on-Trent, Derby, Ilkeston, Leicester, Long Eaton, Loughborough, Mansfield, Newark, and Nottingham, on the invitation of the then chairman of the Electricity Committee of Nottingham (Mr. Councillor Swain) met in conference, and as a result of that meeting associated themselves together to consider the whole question.

Proposals were formulated for the reorganisation of electricity supply in the district, and in July, 1920, the Commissioners held a local inquiry at which the question was exhaustively considered, evidence being given by Mr. Alderman Huntsman and Mr. Rider. In due course the Commissioners granted the application, formal sanction to the construction of the new station being given on September 17th. Instructions were at once given to Messrs. Preece, Cardew & Rider to complete the plans for the first section of the station, the city engineer (Mr. T. Wallis Gordon) was instructed to prepare plans for the foundations and the buildings, and a site of 80 acres was purchased. The foundation stone of the new buildings was laid by Mr. Alderman Huntsman on June 14th, 1923. Progress was hampered in the early stages by the serious shortage of labour and building materials. To meet the growing demands in the city, two 2,000-kW turbo-alternators and two water-tube boilers were erected in the temporary building at North Wilford already mentioned.

The following are some of the contractors for the plant at North Wilford :—Messrs. Pritchett & Gold and E.P.S. Co., Ltd., accumulators; Underfeed Stoker Co., Ltd., ash conveyors and stokers; Stirling Boiler Co., Ltd., boilers; Davidson & Co., Ltd., fans; W. H. Allen, Sons & Co., Ltd., centrifugal pumps; W. J. Jenkins & Co., Ltd., coal conveyors; Stothert & Pitt, Ltd., crane (75 tons); S. H. Heywood & Co., Ltd., crane (25 tons); Babcock & Wilcox, Ltd., economisers and chimneys; G. & J. Weir, Ltd., feed pumps; British Vacuum Cleaner Co., Ltd., flue dust plant; Sheepbridge Coal & Iron Co., Ltd., pipework; P. & B. Evaporators, Ltd., evaporator; F. W. Brackett & Co., Ltd., screens; Foster Bros., Ltd., steel pipes; British Thomson-Houston Co., Ltd., rotaries, switchgear,

Fig. 18.—Map of East Midlands Electricity District.

turbo-alternators, &c.; Callender's Cable & Construction Co., Ltd., cables; Brush Electrical Engineering Co., Ltd., transformers; Worthington-Simpson, Ltd., condensing plant and air pumps.

The photographs reproduced in this article are by Messrs. Henson & Co., of Nottingham. For most of the information we are indebted to a souvenir issued last week.

Defrosting Frozen Meat with Electricity.

A New Process of Australian Origin.

WE were recently favoured with an opportunity of inspecting a process which is likely to be of considerable importance to the public generally, as well as to the electrical industry—the "defrosting" of frozen carcasses by electricity. The process is the invention of Mr. A. U. Alcock, M.I.E.E., managing director of Messrs. Herbert del Cotte Proprietary, Ltd., electrical engineers, of Melbourne, Australia, and was demonstrated to us at the offices of Messrs. Heatley & Co., London. A short note apeared in our issue of September 11th.

For the information of readers who are not familiar with the trade in imported meat, we may premise that the bulk of our supplies of beef are derived from the Argentine, as "chilled" meat, which is never actually frozen, and has to be distributed and retailed immediately on arrival in this country; it cannot be put into cold storage without serious deterioration. Carcasses imported from Australia, however, have to be frozen in order to enable them to withstand the long voyage; in this condition they remain sound and wholesome indefinitely, and can be kept in cold storage at the home ports for any length of time without undergoing change, so that they need not be distributed until the market is ready for their reception—a great advantage as compared with the conditions controlling the chilled-meat trade. Moreover, they can be stored on the premises of wholesale and retail dealers who are provided with cold rooms.

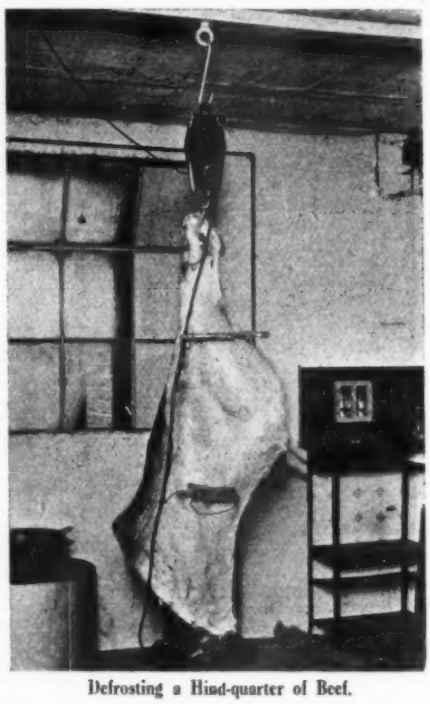
But hitherto frozen carcasses have been subject to the drawback that they could only be thawed by exposure to air at the atmospheric temperature, a process occupying three or four days in summer and a longer time in winter, during this time, as the whole of the heat must necessarily penetrate the carcass from the outside, through the external layer of fat, the outer portions thaw first and suffer deterioration through the prolonged hanging, and loss is incurred from this cause. Further damage results from the fact that the meat juices drain away from the outer portions whilst the inner parts are being defrosted, rendering the meat pale, dry, and unpalatable. Consequently, beef which has been frozen commands a lower price than chilled beef, though the smaller frozen carcasses of lamb and mutton, which obviously thaw much more quickly, have a high reputation and are imported from Australia and New Zealand in enormous quantities.

Mr. Alcock conceived the idea that the process of "defrosting" could be greatly accelerated by the use of electric heating applied to the interior of the carcass, and after long investigation—for the matter proved less simple than it might appear—he has devised a system which, it is claimed, restores frozen meat to its natural condition quickly and without the disadvantages of the atmospheric method of thawing. His process consists of passing an alternating current through the substance of the meat, thus heating it from the interior. By the use of a.c., electrolytic action is avoided; and as the interior of the carcass is thawed first, it is protected from deterioration by the colder surrounding layers. Dripping of the juices is practically negligible, owing both to the sealing action of the frozen surface and to the shortness of the time during which the meat is being defrosted.

The apparatus required for the purpose is very simple. It comprises a small transformer and a set of electrodes, with the necessary connecting leads. The transformer case is provided with large hooks, one of which attaches it to the ceiling, while the other supports the carcass—a matter not merely of convenience, but also ensuring that the connections will naturally fall in the right positions. As the power consumed never exceeds 150 watts, the transformer primary leads can be connected to an ordinary lampholder with an adapter. The secondary leads, of cab-tire-sheathed cable, are suspended from the transformer, and are provided with plug connections well covered with insulating material. Three electrodes are employed: one for the hind leg (the uppermost portion), consisting of three six-pronged forks, which are held in a fibre frame; one for the middle, comprising two similar forks; and one for the thin end of the carcass, consisting of a single fork. These electrodes are driven into the frozen meat with a mallet, at intervals measured with a templet, and are made alive by the plug connections, which are suitably spaced apart on the cable. The triple-fork electrode is attached to one pole of the transformer, and the other two to corresponding connections of the special winding. The prongs are of stainless steel, which neither tarnishes in use nor imparts any taste to the meat.

The current flowing from the middle double-fork electrode to the triple-fork, traverses a solid mass of flesh of about the same length as, but more than double the cross-section of, the remainder of the carcass; whilst the current flowing from the single-fork electrode, traversing the whole length of the carcass, meets with a much higher resistance. Consequently, with the same applied potential difference, a much larger current flows through the solid flesh than through the thinner rib portion of the carcass—thus ensuring that all parts will be defrosted in about the same time.

As the thawing proceeds, the resistance of the circuit diminishes, so that the current tends to increase; for this reason the transformer is specially designed so as to be self-regulating; the process is therefore entirely



Defrosting a Hind-quarter of Beef.

automatic. All that the butcher has to do is to insert and couple up the electrodes, and to remove them when the operation is completed. The electrodes are carefully proportioned so that, on the one hand, there is no local heating, and on the other, the meat is not marked or disfigured in any way that would affect its selling value. The maximum voltage employed is 200 V, and the maximum current is 1.5 A; the total consumption of energy for defrosting a hind-quarter of beef is less than 3 kWh. costing 6d. at 2d. a kWh. The value of the meat defrosted would be from 80s. to 90s., so that the cost of the energy is trifling in comparison with the value

of the meat—much less than the loss that results from the scrapping of rancid fat when carcasses are thawed by exposure to the air. An incidental advantage of the process is that, whereas defrosting by air involves the hanging of carcasses three or four days before they can be cut up and sold, the electrical method involves only one day's hanging; consequently a dealer need only provide about one-third the space and invest one-third the capital hitherto required for frozen meat. But a much more important consideration is the fact that beef defrosted electrically has a far higher market value than frozen meat thawed by air. Thus, the great obstacle to the importation of Australian beef on a large scale is removed, and a further stimulus is given to trade within the Empire.

According to *Whitaker's Almanac* for 1925, Argentina sent us 9,105,651 cwt. of beef in 1923, whilst from Australia we received only 712,127 cwt., a ratio of 13 to 1, whilst the values were in a higher ratio—15 to 1. In the case of mutton, however, New Zealand and Australia furnished 1,464,704 cwt. against Argentina's 1,076,296 cwt. Evidently there is immense scope for increase in the trade in frozen (Australian) beef. The electrical defrosting of the present comparatively small imports of frozen beef alone would represent a revenue of nearly a quarter of a million sterling per annum to the electricity supply industry.

The process and appliances have been patented, and arrangements are being made to hire out the apparatus to users.

Hydro-Electric Possibilities in South America.

Opportunities in Brazil and Bolivia.

(By our Special Correspondent.)

PROBABLY no other State in the world has greater undeveloped hydro-electric potential water power awaiting exploitation than Brazil, nor is there any that has made less progress in this direction. Experts who have examined the many waterfalls and rivers of South America that can be adapted to the generation of energy are agreed that the possible development in Brazil approaches something like 50,000,000 h.p., yet of this total little more than 9,000,000 h.p. is at present harnessed. Successive governments have naturally been desirous of seeing power and light more generally used—especially for industrial purposes—throughout the Union; but, unfortunately, funds with which to foster the enterprise have always been lacking. Brazilians have been as reluctant to subscribe to the hydro-electric undertakings as they have been to finance transport, such as railways and steamships. With some exceptions, these have been left in the hands of foreigners, mainly British (that is to say, Canadian), and the fine services of electric light, power and traction now offered in Brazil are the results of foreign enterprise owing little or nothing to native support.

Where electrical energy has been introduced as a substitute for steam power, it has been found that the saving has amounted to as much as 50 per cent., and in some cases even to more. It is clear that there exists an enormous development for industrial activity in direct relation to the natural resources of the country, facilitated by the provision of cheap hydro-electric power. Among many different enterprises in Brazil, supported, as hitherto, by the contributions of foreign capital, may be mentioned a project known as Mar Energo, the promoters of which will endeavour to utilise tidal energy. A moderate preliminary capital, consisting of 1,150 milreis, has been subscribed, and a patent has been taken out for a "hydro-motor." It is considered doubtful, however, whether the undertaking will make very much progress.

Lack of funds has again interfered with the carrying-on of the long-delayed Brazil Central Railway electrification scheme. As far back as 1922, a loan of $25,000,000 was raised in the United States clearly labelled "Central Railway Electrification Loan." But instead of expending the money obtained upon the prosecution of this enterprise the Government of the day, with the consent of the President, Dr. Epatacio Pessoa (who afterwards attempted to excuse the action), expended the greater part of the proceeds upon improving the Federal Railways. No further capital from abroad was then obtainable, and by the end of 1923 little or nothing had been done towards carrying out the electrification of the Central Railway. During the past year or so some appreciable progress has been made, not sufficient, however, to enable the management to institute a scale of working economies such as were expected and promised. Now, another halt in construction has ensued, and before further work can proceed a credit of at least 1,500 contos of reis will be needed. A large sum on account has been asked for to carry out urgent repairs, but the Brazilian Congress has not as yet voted the payment.

A commencement has been made upon the electrification of a part of the Oëste-Minas Railway, the contract being in the hands of the Metropolitan-Vickers Electrical Co., Ltd. The portion of the line referred to is between Barra Mansa and Augusta Pestana, a length of about 71 km.

When the existing contract with the Sao Paulo Railway Co., a British-owned concern, terminates two years hence, it is proposed to build a competitive and parallel line, wholly worked by electricity, to provide facilities at the port of Santos. For this purpose an enormous capital would be required, and although it is expected that the Brazilian Government will promise a large contribution, the entire sum cannot be derived from that source. The Minister of Public Works, Dr. Francisco Sá, is doing his best to raise capital, but at the time of writing his progress seems to have been very slow. The best way out of the difficulties with which transport in this—the most important—commercial centre is confronted, will be for the Brazilian Government to renew its contract with the British company, which, on its part, has expressed its willingness to build a parallel line to its own and then work the two in conjunction. But for the local hostility and jealousy displayed, this scheme would undoubtedly have recommended itself to the Government, Federal as well as State. Political, rather than economic, reasons have hitherto prevailed, and the Administration has not seen its way to accept the offer.

But for the new political upheaval in Bolivia that has recently taken place, and promised to be one of a series of similar presidential election disturbances, foreign capital would have been forthcoming for one or other of the various schemes put forward for the utilisation of the hitherto untouched available water power for the production of electricity on the eastern slopes of the Andes. Congress has had this matter under discussion upon various occasions over a number of years, and it was hoped that certain developments would have been decided upon this year. The Senate has likewise manifested its interest in the proposal by instituting—and eventually accepting—Governmental surveys.

D

Another Bolivian project suggested, but one which is considered wholly impracticable, is in connection with the utilisation of the waters of Lake Titicáca. It is reported that German engineers have asked for a concession to utilise this lake, the area of which is estimated at 5,000 square miles, standing at an altitude of 12,800 ft. The catchment area apparently is enormous, but the rainy season lasts only for three months of the year, and the extent of evaporation is very large. Between the wet and dry seasons the maximum difference of water level is about three feet. The natural discharge is through the Desaguavero, a sluggish river which remains nearly dry during six months of the year, and eventually loses itself in the Bolivian plateau located about 500 km. south. The only method by which the waters of Lake Titicáca could be utilised for the provision of electric power would be to construct a tunnel 100 km. in length, but when the cost of such an enterprise is considered, the proposition appears wholly impracticable.

Legal.

St. Helens Corporation Summoned.

THE St. Helens Corporation was summoned at the local court on September 14th, by two residents, Messrs. V. Hanratty and W. Leather, for a breach of its Electric Lighting Order. It was stated that Mr. Leather applied to the Corporation on July 13th for a supply of electricity, having had his house wired. The Corporation, however, although written to twice, had not connected up with the main or supplied a meter, on which a deposit of £2 had been paid.

Mr. DAVIES, for this plaintiff, said that the trouble appeared to be that the house had been wired by plumbers who were not members of the E.T.U., and the E.T.U. jointers employed by the Corporation therefore refused to connect the house to the mains. He directed attention to the decision given on November 14th last, when a fine was imposed on the Hackney Borough Council, which pleaded *force majeure* in a case in which that Council's electricians threatened to cease work if a house wired by non-union labour was connected up.

Plaintiff said that the difficulty between the Corporation and its workmen had nothing to do with him.

Mr. GOLDIE, for the Corporation, said that the permission which had been given for plumbers to wire up houses had been withdrawn because of the unemployment amongst the electrical workers. He read a letter from the district secretary of the E.T.U. stating that if the Corporation connected up plaintiff's house, the 40 E.T.U. members employed by the Corporation would strike and would receive the support of 150 other E.T.U. men. The whole of the public supplies of electricity would then be stopped.

The Corporation pleaded that the decision in the Hackney case did not apply to the one in dispute. The Electricity Committee had tried to overcome the difficulty which had resulted in those proceedings, by getting a workman from Liverpool to do the work, but objections were raised.

The magistrates, in giving a decision against the Corporation, imposed a penalty of 1s. per day.

Notice of appeal was given.

Reviews.

Ether and Reality. By SIR OLIVER LODGE, F.R.S. Pp. 179. London: Hodder & Stoughton, Ltd. Price 3s. 6d. net.

Sir Oliver Lodge is now an old man full of years and honours. His distinguished career in science extends over the whole period within the memory of most men now living and, as may be gathered from the title-page of the book before us, almost every scientific society of note has been proud to receive him. A doctrine therefore in which he firmly believes, and to which he has been constantly faithful, is a doctrine which must be treated with respect.

The doctrine which Sir Oliver Lodge proclaims is the reality of the ether of space. He thinks it is the fundamental substance of the material world, and the connecting link which unites it with the spiritual world. Now the difficulty about believing in the reality of the ether is that we have to ascribe to it properties of fluids and properties of solids which are mutually exclusive. It must be lighter and vastly more fluid than any gas, in order not to retard our motion round the sun or deprive the earth of its atmosphere by friction; on the other hand, it must behave like a solid vastly more rigid and dense than any metal, in order to transmit the radiation of light. These are examples of the contradictory properties with which it is necessary to endow the ether, in order that it may fulfil the functions ascribed to it by the interpretation of phenomena. These contradictions strain belief—even the belief of scientific men, which of late has been assuming the elasticity at one time peculiar to that of theologians. As Prof. Lodge says:—"We used to try to explain the properties of the ether in terms of matter. Lord Kelvin made a life-long effort in that direction, and at the end of his life he had to announce failure. The failure was due to no defect of his; such an explanation is impossible. Ether is not to be explained in terms of matter."

At this point it would occur to most people to conclude that the time has, therefore, now come to abandon the ether; but this is not the conclusion reached by Prof. Lodge. He goes on: "We have learnt that the problem lies in the opposite direction; and modern physics, since Lord Kelvin's time, may be said to be devoting itself to the explanation of matter in terms of ether."

One is, somewhat inconsequentially, reminded of Mahomet, who, when the mountain would not come to him, decided that it would be the same thing if he went to the mountain. And the mountain is, in this case, a mountain shrouded in mists, for this ether by which the whole universe is to be made comprehensible, is itself past understanding.

However, those who would like to see the case for the ether well put, ably put, better put, some would say, than the case deserves, cannot do better than peruse this book, as they may do with no great pains to themselves; because it is well written in the easy style of one who is a past master in the use of the expository pen. They will be interested to learn that he makes the density of ether, compared with water, to be "one followed by twelve o's—or of that order of magnitude." From which it may be inferred that if we compared its density with that of steel, eleven o's after the 1 might suffice to represent it. Truly we need faith that will move mountains.

The China Year Book, 1925-6. Edited by H. G. W. WOODHEAD, C.B.E. Pp. 1,349. Tientsin: The Tientsin Press, Ltd. London agents: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. Price 42s. net.

The many phases of China and Chinese life with which this large volume deals make it of interest to almost anybody into whose hands it may come. Geography, geology, natural history, mineralogy, trade, and history are only a few of the subjects which are dealt with in a masterly way either by the Editor himself (who is also the editor of the *Peking and Tientsin Times*) or able collaborators. Interesting as the matter is, we must reluctantly confine our attention to the electrical and trade sections in this short review. Among many other matters in the part dealing with engineering is a list of electricity undertakings arranged by provinces alphabetically. This shows that there are few Chinese towns of any size which are unprovided for in this respect. There are about 230 undertakings in the list, most of them of very small capacities; in fact, only about 20 (including the Shanghai undertakings) have plant of more than 1,000 kW. The particulars given in each case are the name of the operating company or other authority, the capital employed, and the capacity of the station. Brief mention is made of the fact that tramways are operated in a number of the principal cities, including Dairen, Hong-Kong, Shanghai, Tientsin, and Peking.

A brief history of the Chinese telegraph system appears in another part of the work, and details are given of the conventions which exist between the Chinese Government and the cable companies and other countries. This is followed by some statistics relating to the service, *e.g.*, it is stated that the length of land lines is 55,331 miles, the length of wires 78,852 miles, and that 5,197,596 "domestic" telegrams were transmitted in 1919. It will be judged from the last statement that the figures are not very recent ones, but there are good reasons for this, as all who have read the newspapers during the last two or three years are aware. The information upon radio-telegraphy is more up-to-date, and a list of stations is given showing the type of equipment, the power employed, the controlling authority, &c. Forty-five stations are listed.

The section dealing with Chinese commerce is particularly interesting, as it traces China's trade with the outside world from the earliest records (B.C. 1122) to the present day. A separate note is devoted to England's trade with China, dating from the sixteenth century since when this country has held the principal position in China's foreign dealings. The existing commercial treaties are reviewed, and the section closes with a chapter on trade during 1923-24. This shows that the value of imports during that year was very little below the record level reached in 1922, while the exports were practically on the 1913 plane in actual values.

The year book contains a great deal of matter relative to the political and military situation which should prove of service to the general reader to whom the average newspaper report is very obscure.

Electrical Machinery Erection. By TERRELL CROFT. Pp. ix+314; 334 illustrations and drawings. London: The McGraw-Hill Publishing Co., Ltd. Price 15s. net.

There are many problems which are met with when transporting and erecting any kind of heavy machinery, but electrical machinery presents many peculiar problems of its own. For example, a lathe is always erected on the floor of the workshop, but the electric motor driving the line shaft may be bolted to the girders of the floor above, to the columns supporting the roof, or, indeed, in any convenient position which may be available. Thus, while in the book under review the author discusses many problems which might arise in any

engineering works, a number of them are peculiar to the electrical industry. It is to be noted, however, that the title which he has chosen does not do justice to the ground which he has covered, as in addition to the problems of erection he discusses the question of transporting machinery from the manufacturer to the user, while he also includes a useful section on the maintenance and upkeep of electrical machinery.

The work is divided into five sections and although the questions discussed in certain of these are somewhat similar to those met with in other sections of the book, the division seems to be an eminently wise one. The first, which is called "Unloading and Moving Electrical Machinery," deals with the problems of transferring a machine from the test bed to railway truck or wagon, and thence transferring it to a wharf for shipment or depositing it in the works of the user. The question of slinging is discussed, including the problem of strutting, &c., to prevent the bedplates bending under their own weight, and the protection of windings during slinging. Useful tables are included, giving the strength of slings and approximate figures for the cost of handling machinery are also given. The book, it should be noted, is of American origin, so that the costs which are given in dollars can only be considered in a comparative sense. The next section is entitled "Supporting Electrical Machinery," and in it will be found details of a number of useful forms of brackets and girder arrangements for securing motors on walls, ceilings, columns and beams, or on the framework of machine tools, &c. Tables giving the strengths of beams and girders of different sections and spans are included in this section. The third section, which is called "Erecting Electrical Machinery," deals more particularly with the construction of temporary supports and staging for transferring heavy machinery from the crates or wagons to its final foundations. There are certain parts in this section which are similar to those in Section I, but it contains much information of a useful character, while the question of shrinking on flywheels, &c., is of value because it is seldom met with in text books. It may be mentioned that the problems of erecting generators, motors, and heavy transformers are all considered in this section. In the fourth section, the machine being on its foundation the final work of alignment and securing to the foundations is considered, the problems discussed ranging from small motors with pulleys to be correctly set relative to the pulleys on a countershaft, to the alignment of a large turbo-alternator. The final section, which is, perhaps, rather out of place in a book of this kind, deals with the maintenance of electrical machinery, such problems as re-mettling bearings, care of roller and ball bearings, the removal of dust from windings and commutators being discussed. The importance of routine inspection is mentioned and useful maintenance charts are given.

The author is to be congratulated upon having put into book form a great many useful facts and some valuable data dealing with a phase of engineering practice which, despite its importance, has not received the attention it deserves. The book is very carefully illustrated, a feature being the perspective line drawings which convey at a glance the author's meaning. A very complete index is appended which greatly facilitates reference to any particular problem, while for the earnest student of the book a number of questions are given at the end of each section which cover thoroughly the subject matter of that section. Altogether it is a book which we can thoroughly recommend to every engineer who has to deal with the transport or erection of electrical machinery.

The Elements of Machine Design. By S. J. BERARD and E. O. WATERS. Pp. x+323; figs. 244. London: Blackie and Son, Ltd. Price 10s. net.

There are certain branches of knowledge which cannot be taught, they can only be slowly acquired in the hard school of experience. We are inclined to think that machine design must be regarded as coming in this category. Not that it is impossible to prepare a young engineer to become a draughtsman and a designer, but no matter how complete that preparation may have been, it will generally be conceded that such a person could hardly be qualified to prepare the designs for, say, a 25-h.p. motor which could be manufactured on a competitive basis with the designs prepared by a man who has had years of experience in this particular branch of engineering work. It seems to us, therefore, that the authors of this very excellent book have rather misjudged its purpose when they suggest that it should fill a gap between engineering drawing and advanced machine design, although they are on less debatable ground when they express the hope that it will serve as a guide for students in technical schools and for young draughtsmen. For this purpose it is certainly one of the best books we have seen for many years, and the young engineer who has thoroughly grasped the various principles explained in the course of its 323 pages should be able to solve in the most satisfactory manner those practical problems with which he will be faced as soon as he commences the most simple design work in a commercial drawing office. It may be questioned as to how far it is possible in a textbook to lay down the fundamental economic principles governing the production of any work on a commercial basis, but certainly in this book no attempt is made to attack this vitally important side of the problem at all, and to that extent it must be deemed to fall short of fulfilling the requirements of advanced design. With this reservation, however, we may at once assert that the authors have produced a book which is particularly well suited to guide the student or the young engineer who is desirous of becoming a designer.

It will be admitted that a knowledge of the materials used in engineering construction is of great importance to the designer, and hence the authors rightly give prominence to this part of the subject in their opening chapters, and not only do they deal with the simple ideas of stress due to direct loads, bending and torsion, but a brief outline of the method of production of the various constructional materials is also given, including such processes as tempering, case hardening, and the production of malleable-iron castings. We note here, however, that while combined bending and torsion is dealt with, the strength of material subjected to combined compression and bending, *i.e.*, the familiar strut as represented by the connecting rod of an engine, has been overlooked. After these preparatory chapters, the design of various fastenings is considered, the problems of rivets, bolts and nuts, keys and cotters being dealt with in accordance with the principles of the strength of materials enunciated in the earlier part of the book. This is followed by a number of chapters on what is sometimes known as millwrights' work, *viz.*, shafts, bearings, pulleys, belting, &c., after which four admirable chapterms on gearing are given. In these four chapters toothed gears of all kinds are dealt with, including worm gears and an excellent design of enclosed worm gear suitable for a low-speed drive from an electric motor is worked out. The book concludes with a treatment of the various reciprocating steam engine details, including pipes and valves. A brief survey of the elementary problems of structural design using rolled sections is also given.

Thus, within a comparatively small compass the authors have succeeded in covering the whole of the syllabus usually set for examinations in this important subject. They have also included a number of tables for standard dimensions of various fittings, and numerical examples illustrating the various problems in design are also given. The book, we ought to mention, is of American origin, and some of the standards included, as well as some of the symbols employed, are different from those used in British practice, but the work hardly suffers on that account, as the tables of standards are available in the majority of engineering pocket books, and these can be very easily obtained. A word of praise must be given to the producers of the book. The drawings are extremely well done, being clear and of large scale, no attempt having been made to include too much within the compass of a page of a text-book as is so frequently the case in books of this kind. Moreover, where necessary the ordinary orthographic views are assisted by carefully-drawn perspective views as well as half-tone photographs, so that little or no difficulty should be experienced in understanding the exact shape of any machine detail under consideration. The whole book has been printed on smooth-surface art paper, which adds greatly to the clearness of both text and drawings, and at the price given above the book must be regarded as an exceptionally good production. We can recommend it to the young draughtsman and to the technical student with the utmost confidence.

The Theory of Electric Cables and Networks. Third edition. By ALEXANDER RUSSELL, M.A., &c. Pp. xii+356; figs. 88. London: Constable & Co., Ltd. Price 24s. net.

As in the previous editions, the work commences with a *résumé* of the fundamental principles pertaining to the design of networks and the distribution of electrical energy, and deals with the highly theoretical considerations of dielectric strengths and stresses. Although the book is, in the main, a theoretical treatise, it is written throughout with a view towards the conditions met with in practice. Much practical information, for instance, is given in the chapters on distributing networks and faults in networks. The chief addition to this edition is in the appendix, where the question of how far the position of the power station site is affected by the cost of the copper for the requisite feeder mains is discussed.

The Small Cost of Power.—Power salesmen are often confronted with the statement by a prospective customer that the power rate is too high. An effective answer to this objection has been found by many salesmen in the statement that the cost of power is a very small percentage of the total manufacturing cost, whereas the many desirable and valuable features of purchased power make its use an important advantage to a manufacturer. The relation of power costs to the total manufacturing cost in specific industries is frequently helpful in convincing a prospective power user. A recent study of power cost and its relation to total manufacturing costs of twenty-one industrial power users showed that, with very few exceptions, the cost of power was less than 3 per cent. of the average manufacturer's production expenses.—*Electrical World.*

Hydro-Electric Development in the United States.—A recent report of the United States Geological Survey states that at March last the total capacity of hydro-electric plant installed in the United States was 10,038,000 h.p. This figure includes only machines of 100 h.p. or more. The greatest development is in the State of New York (1,713,550 h.p.), while the next in order are California 1,531,480 h.p., Washington 560,693 h.p., North Carolina 534,600 h.p., and Maine 476,627 h.p. It is estimated that the undeveloped power in these states will permit of the installation of the following amount of plant:—New York 4,734,000 h.p., California 7,145,000 h.p., Washington 9,672,000 h.p., North Carolina 526,000 h.p., and Maine 920,000 h.p.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Employment in the Engineering Industry.—The September *Ministry of Labour Gazette* states that employment in the engineering industry during August remained bad on the whole and showed a further slight decline. Conditions in the electrical engineering branch remained fairly good. While the proportion of unemployed in the industry as a whole was 11.8 per cent., the proportion for the electrical engineering branch was only 5.9 per cent., a decrease of 0.1 per cent. as compared with the July figure. In the electrical wiring and contracting industry there was a decrease of 0.8 per cent. in the number of unemployed, and there was a fall of 0.3 per cent. in the electrical cable, wire and electric lamp manufacturing group.

Threatened Tramway Strike at Salford.—A dispute arose last week in the Salford Corporation Tramway Department owing to the employment of four non-unionists. Strike notices, due to expire on September 20th, were served. Three of the men who were the cause of the dispute agreed to join the Transport and General Workers' Union, while the fourth man, who refused to join the union, went on holiday and the strike notices were suspended until his return.

For Sale.—Messrs. Knight, Frank & Rutley will sell by auction, on September 29th and following days, at the Alpine Club Hall, 23, Savile Row, W., a quantity of new electric lighting fittings, &c. Dundee Corporation Electricity Supply Department has for disposal two 2,000-kW Willans-Parsons steam turbines coupled to Dick Kerr 3-phase alternators, complete with condensers, air pumps, &c. Mr. H. J. Shaw will sell by auction on September 29th at 13, High Holborn, W.C., the stock of an electrical and wireless goods factor. The Burgh of Oban electricity department has for disposal steam generating plant. The Chief Engineer, H.M. Office of Works, invites offers for the whole of the plant and equipment of H.M. power station, Beachley, near Chepstow. Preston Corporation electricity department invites offers for surplus turbo-generators, boilers, &c. (See our advertisement pages to-day.)

The Radio Industry: The Question of Protection.—It is reported by several daily papers that application is being made to the Board of Trade for the safeguarding of the British radio industry. According to statements attributed to Mr. Guy Burney, whose retirement has lasted for quite as long a period as those who know him would have anticipated, the brief of the trade (he is chairman of the National Association of Radio Manufacturers and Traders' Committee) is now completed. He states that for the year ended December 31st last radio manufactures to the value of not less than £850,000 came into this country. Germany, Austria, and France (and America, in a lesser degree) were the chief invaders of the British market, and so far their competition had been most harmful in the matter of headphones. Not less than 2,000,000 pairs of these were sent into the British market last year, at prices approximately 50 per cent. below the price at which we can afford to market them in this country. Dealers declare that they can sell ten foreign headphones to one British because the low prices appeal to the small constructor.

Lead. — Reporting on September 19th, Messrs. James Forster & Co. stated:—"There are reports of lessened consumption on the Continent, due to the high price of the metal and credit difficulties, particularly in Germany. Here consumers have not been much in evidence this week, but consumption is on a very heavy scale, and consumers, as a rule, are not well bought forward. The Board of Trade returns for August are:—Imports, 23,414 tons; exports, 2,161 tons; leaving for home absorption 21,253 tons. The total of the last for the eight months to the end of August is 162,627 tons."

A Wireless Exhibition Criticism.—The Wireless Retailers' Association recently addressed a communication to the National Association of Radio Manufacturers and Traders protesting against a particular retail firm being permitted to announce in the Albert Hall Exhibition catalogue that wireless sets and components were available for immediate purchase and delivery at their stand, and to further state that the productions of any of the exhibitors on the ground floor could be supplied for immediate delivery to the public. Exhibitions of this character, said the W.R.A., were organised by the trade to enable trade buyers to inspect exhibits and to place orders, and to afford the public opportunities to inspect manufacturers' products, the names of intending purchasers of these being passed on for handling through retail channels.

The British Industries Fair.—We have received from the general manager of the Birmingham section of the British Industries Fair an advance prospectus of the 1926 display. This will be held at the Castle Bromwich Aerodrome from February 15th to 26th. At the head of the prospectus is a statement that the Government has agreed to spend a sum of money not exceeding £25,000 for the purpose of publicity for the Fair at home and abroad. It is stated that the results of the last Fair were so satisfactory that many participants have already applied for increased stand accommodation, and it is worthy of note that the price of space has been reduced by a substantial amount (20 per cent). Special arrangements for low-priced small stands for firms that are unable to take much space have been made. The Birmingham Section is divided into eleven classes, *viz.*:—Brassfoundry, hardware and ironmongery; metals; construction, building and decoration; power, lighting, heating, cooking, and ventilating; engineering; agriculture; mining; motors, cycles, &c.; guns, saddlery, &c.; brewing, &c.; and "services." The list of members of the Council includes the names of Mr. G. P. Achurch (Parker, Winder & Achurch); Mr. J. Belliss (Belliss & Morcom, Ltd.); Mr. F. Forrest, M.I.E.E., and Dr. C. C. Garrard (General Electric Co., Ltd.). The Fair Management Committee includes Mr. R. A. Chattock, the city electrical engineer, and Mr. Alfred Baker, general manager of the Corporation tramways.

The Sale of Appliances by Supply Authorities.—The feeling expressed at this year's I.M.E.A. Congress that electricity supply authorities should have power to sell electrical appliances (and exercise it) has its counterpart in the United States. The National Electric Light Association is endeavouring to impress upon its supply company members the importance of undertaking the sale of electrical appliances. In a recent issue of the *Electrical World* the president of the N.E.L.A. stated: "Every power and light company should have an efficient sales organisation, an advertising department directed by someone who has made a study of advertising, and should obtain the advice and utilise the ability of a person who knows how to decorate and trim windows properly and forcibly."

Trade Announcements.—The telephone numbers of the "FERROWATT" ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., 72, Oxford Street, W.1, are "Museum 5053-4."

MR. E. T. KING, of Messrs. Bass & Co., 120, High Street, Rickmansworth, informs us that he has taken over the business at that address and is responsible for all debts.

MR. H. STANLEY SMITH, of the Silchester Electric Stores, 2, Silchester Road, Hastings, has taken larger premises at 45, London Road, Hastings.

MR. T. BRERETON, formerly with Carrington & Button, has commenced business with his son at Evleston Road, Crewe, as electric lighting specialists.

MR. L. J. WOLF has commenced business on his own account at 116, Putney Bridge Road, London, S.W.15, where he will act as sole distributor for the Robbins & Myers Co., of Springfield, Ohio, U.S.A. Mr. Wolf was until 3½ years ago managing director of the original Wilson-Wolf Engineering Co., Ltd., and subsequently he managed the small motor department of Messrs. Pooley & Austin.

The business of the ASTRO ELECTRIC, LTD., in its entirety has been purchased by the B.I. Syndicate, Ltd. It will be continued at the same address (45-48, Carlton House, Lower Regent Street, London, S.W.1). Mr. R. Rook-Jones continues as sales manager and practically all the old staff has been retained. A folder has been issued giving reduced prices of certain types of reflectors.

On October 1st the telephone numbers of the POWER EQUIPMENT CO., LTD., of Hendon, will be altered to: "Colindale 6196 and 6197."

Sales Development.—An all-day conference of members of the Incorporated Society of British Advertisers on the problem of increasing sales in the home and oversea markets is to be held at the Hotel Cecil on Thursday, October 29th, to be followed by a banquet in the evening. It has been arranged that on the second Wednesday evening in each month, commencing in November, there shall be a dinner at the Old Colony Club, Aldwych, followed by a business meeting.

Bankruptcy Proceedings.—WM. REGINALD GRIGSBY, dealer in electrical goods, &c., 184, Gray's Inn Road, W.C.—This debtor carried on business as the Wenham Lighting Corporation. He failed in June, 1925, with liabilities £2,577 against assets valued at £909, and on September 15th he attended for public examination before Mr. Registrar Hope at the London Bankruptcy Court. Questioned by Mr. Wheeler, Assistant Official Receiver, the debtor stated that in August, 1911, he purchased his father's business of gas lamp manufacturer and subsequently opened a branch for the sale of electrical goods and took up contracts for electric lighting. In 1924 he entered into a partnership with a Mrs. Clark in relation to a contract for electric lighting at the British Empire Exhibition, which involved him in a heavy loss. The debtor also attributed his failure to lack of capital, bad debts, and depreciation of stock. The examination was concluded.

T. W. CRAWFORD, merchant, 32, Victoria Street, S.W.1.—Under a receiving order made on August 31st upon the petition of a creditor, the first meeting of creditors was held on September 16th, Mr. Walter Boyle, Senior Official Receiver, presiding. According to the debtor's statements in preliminary examination, he started business in December, 1923, under the style of The Despina Company, at 41, Cheapside, dealing mainly in electric lamps. The British Thomson-Houston Company, Ltd., obtained an injunction against him in June, 1924, restraining him from infringing its patents, and as a result of that action he closed down the business, together with a branch

which he had opened in Liverpool. In the following September the debtor took offices at 32, Victoria Street, S.W., and there carried on a similar business in the name of T. Wheatley and Company, but in consequence of bad trade and the lack of financial support, he had to close the business last April. The failure was further attributed to illness and heavy overhead charges. No accounts were lodged but the chairman reported that the liabilities were roughly estimated at £700 and the assets were very small. The estate was left in the hands of the Official Receiver.

THOMAS BARTON, Electric Works, Ainsworth Street, Blackburn, electrical engineer.—The public examination of this debtor was held on September 16th at the County Court, Blackburn. The statement of affairs showed gross liabilities of £8,833, of which £3,813 was expected to rank, against assets of £5,793, leaving a surplus of £1,980. The Official Receiver said that debtor commenced business at Ainsworth Street in 1886 with £600 capital lent him by his wife. In June last he executed a deed of assignment for the benefit of his creditors, at which time the liabilities were shown at £3,686, while the assets were estimated at over £4,000. Questioned by the Official Receiver, debtor said that at first he did not consider he was solvent, but on reconsideration he was now quite satisfied that he was perfectly solvent. The examination was closed.

F. J. TIZZARD and N. TIZZARD, trading as Tizzard Bros., 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness, electrical engineers and contractors.—The receiving order in this matter was made on the debtors' own petition. The first meeting of creditors was held on September 12th, at the Official Receiver's office, Barrow-in-Furness, when the case being a summary one was left with the Official Receiver as trustee. The following are creditors :—

	£		£
Chloride Electrical Storage Co., Ltd.	21	N.W.E., Ltd.	31
Marsoleus	71	Thornton, W. R., & Son, Ltd....	124

ARTHUR KITSON, 1, Central Hall Buildings, Westminster, electrical and mechanical engineer.—The adjourned first meeting of creditors was held on September 21st at the London Bankruptcy Court, before Mr. Wheeler, Official Receiver, when a resolution was passed appointing Mr. Thomas Langley Judd, 40, King William Street, E.C., trustee to administer the estate in bankruptcy. The debtor stated that he was not prepared to submit any offer to the creditors at present. He was now working on a scheme for the reorganisation of the Kitson Engineering Co. (London), Ltd., and if his efforts were successful he would be able to pay all his debts in full.

W. H. MURAD (W. H. Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—Application for discharge to be heard October 26th, at the Court House, Manchester.

A. WOOD, electrical agent, 67, Bradford Avenue, Cleethorpes, and 161, Cleethorpes Road, Great Grimsby.—First and final dividend of 9d. in the £, payable at the Official Receiver's office, St. Mary's Chambers, Great Grimsby.

C. E. F. PARKER, electrical engineer, Greendale, Privett Road, Gosport.—Receiving order made September 11th, on debtor's own petition.

C. F. LINDOP (C. F. Lindop & Co.), electrician, late of 62, Dale Street, Liverpool.—Application for discharge to be heard on October 16th at the Court House, Liverpool.

J. COWAN (Cowan & Fox), merchant of electrical appliances, 35, Dickinson Street, Manchester.—First and final dividend f 8½d. in the £, payable September 29th at 30, Belgrave Place, Stalybridge.

B. E. DIXON (Creswick Dixon Electric Co.), electrical engineer, Bodega Buildings, High Street, 101a, Albert Road, 451, London Road, and 63, Chesterfield Road, Sheffield; and Electric House, Knifesmith Gate, Chesterfield.—First and final dividend of 5½d. in the £, payable at the offices of Messrs. Poppleton, Appleby & Turner, 155, Norfolk Street, Sheffield.

Company Liquidations.—M.E.L., LTD., mechanical and electrical engineers, 45-7, King's Road, Camden Town.—The statement of affairs in this case shows liabilities of £12,331 against assets valued at £2,575. The following are creditors :—

	£		£
Abingdon Works, Ltd.	524	Reliance Electrical Wire Co. ...	40
Booth, J., & Co., Ltd.	192	Smith & Sons	220
Burton, H., & Co.	51	Swift, Levick & Sons, Ltd. ...	681
Castle, T. L.	61	Sankey, J., & Sons, Ltd. ...	141
Connollys, Ltd.	97	St. Pancras Elec. Dept. ...	32
Cundell, Eve & Co.	97	Sun Electrical Co., Ltd.	29
Curtis, P., Ltd.	40	Stokes, C. H.	377
Dacier, Ltd.	28	Sheffield Magnet Co.	260
Dynon & Co. (Enfield), Ltd. ...	119	Warner, W. G., Ltd.	276
Davis & Timmins, Ltd. ...	31	King, Sir A. F., W. Rogers, E. D. Pearcy	195
Ebonestos Insulators, Ltd. ...	728	Pearcy, E. D.	152
Evans, Jarvis & Sherry ...	126	Rogers, W.	4,381
Gas Light & Coke Co.	56	King, Sir A. F.	158
London Electric Wire Co. and Smiths, Ltd.	47	Earle, W., Exors of	573
L.P.S. Electrical Co.	95	Goulding, T. W.	631
Bankers	350	Brown, S. H.	82
Phillips (Patent Agents) ...	22		

WILL SMITH, LTD., electrical engineers, 281, West Derby Road, Liverpool.—A meeting of creditors was held recently at the offices of Messrs. R. Duncan French & Co., Liverpool, when a statement of affairs was submitted which disclosed liabilities of £2,028, and net assets of £43, leaving a deficiency as regarded the creditors of £1,985. The company was registered in March, 1920, with a nominal capital of £2,000, of which £1,901 had been issued, to take over an existing business, the purchase price being £600, of which £50 was payable in cash and the balance in shares. During the year ended March, 1921, there was a profit on the trading of £75, but in the following twelve months there was a loss of £295, and in the succeeding twelve months a loss of £1,100. For the twelve months to March, 1924, the loss exceeded £1,000, whilst for the year to March, 1925, there was a loss of £487. Since March last there had been further losses. Last May £200 was lent to the company on the security of a debenture. A receiver had since been appointed on behalf of the debenture holder. It was suggested that the debenture holder's claim should be withdrawn and the assets divided amongst the other creditors. The Receiver stated that he would see his clients on the matter, and the meeting was accordingly adjourned. The following are creditors :—

	£		£
General Electric Co., Ltd. ...	597	Rowe Bros. & Co.	88
Preston, C., & Co.	25	Loze, A., & Co.	73
Copeland, Green & Co.	35	Blakeborough Outdoor Publicity Co., Ltd.	119
Corfax Co., Ltd.	43		

HOLBORN RADIO CO., LTD.—Liquidator, Mr. G. D. Pepys, Official Receiver, Carey Street, W.C., released September 15th.

FORD ELECTRICAL CO., LTD.—A meeting of creditors is called for October 20th at 10, Norfolk Street, Manchester, to hear an account of the winding up from the liquidator, Mr. J. F. Stott.

Private Arrangements.—B. H. WISHAW and N. S. ETHELL, trading as Wishaw & Ethell, electrical and radio engineers, Bakewell Road, Matlock.—A meeting of creditors was held recently at the offices of Messrs. Heny & Heny, Matlock, when an approximate statement of affairs was submitted which disclosed liabilities of £832, all due to unsecured creditors. In addition, there were fully secured creditors for £84, who held securities valued at £100, leaving a surplus of £16. The net assets were valued at £708, leaving a deficiency of £124. Complete books of account had not been kept, so that trading figures could not be prepared. The deficiency was stated to be due to loss on trading. It was decided that a deed of assignment should be executed in favour of Mr. Charles Turner, C.A., of Sheffield, as trustee, provided the execution creditors withdrew from possession. A committee of inspection was also appointed, consisting of the representatives of the General Electric Co., Ltd., and Metro-Vick Supplies, Ltd., and Mr. J. F. Warburton, accountant, representing creditors.

Catalogues and Lists.—ACCUMULATORS OF WOKING, LTD., Maybury Hill, Woking.—Illustrated pamphlets giving particulars of accumulator batteries for house lighting, train lighting, radio work, &c.

"M.K." ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—An illustrated and priced catalogue of "M.K." switches, connectors, wall-plugs and sockets, &c.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—A descriptive list of three-phase induction motors. Illustrated.

MESSRS. A. J. STEVENS & Co. (1914), LTD., Wolverhampton.—A series of illustrated and priced pamphlets dealing with amplifiers and loud speakers. Also two pamphlets dealing respectively with hire-purchase and insurance schemes for radio receiving sets.

MESSRS. DAVID BROWN & SONS (HUDDERSFIELD), LTD., Park Works, Lockwood, Huddersfield.—An illustrated brochure describing the company's works and products.

MESSRS. RICHSON & Co. (1925), LTD., 113, Oxford Street, W.1.—A well-printed catalogue containing numerous illustrations, many in colour, of electric lighting fittings mainly of glass and art metal ware. Priced.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Folders H.3764, 3765, and 3766, dealing respectively with "Magnet" electric cookers, electric fires, and domestic appliances. Illustrated and priced. Leaflet O.S. 3731, containing particulars and prices of "Osram" gasfilled lamps.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflets Nos. 35/5-1 and 35/6-1, illustrating and describing "Type C K B" high-torque, high-efficiency, squirrel-cage motors; and a price list of "Cosmos" vacuum and gasfilled lamps.

MESSRS. FALK, STADELMANN & Co., LTD., 83, 85 and 87, Farringdon Road, E.C.1.—An illustrated catalogue (No. 549) of "Lucifer" portable electric lamps and "Efesca" batteries; and Catalogue No. 547, dealing with electric bells and telephones. Both publications are fully priced.

THE CABLE ACCESSORIES CO., LTD., Tividale, Tipton, Staffs.—A priced pamphlet of tumbler switches, wall plugs, bells, &c.

MESSRS. NALDER BROS. & THOMPSON, LTD., 97A, Dalston Lane, E.8.—An illustrated brochure dealing with "N.C.S." relays for use in connection with the distribution of electricity.

DICTOGRAPH TELEPHONES, LTD., Aurelia Road, Croydon.—An illustrated booklet, advertising the firm's intercommunication system.

MESSRS. JOHN BELL & CROYDEN, LTD., 50-52, Wigmore Street, W.1.—List No. 6, containing an illustrated description of the "Arnold" osteoscope, an X-ray device for use in the fitting of boots and shoes. Priced.

MESSRS. C. A. VANDERVELL & Co., LTD., Warple Way, Acton, W.3.—Publication No. 7, containing prices and details of radio transformers, loud speakers, accumulators, &c.; and Publication No. 3, dealing with automobile lighting equipment.

MR. L. J. WOLF, 116, Putney Bridge Road, S.W.15.—A series of illustrated pamphlets dealing with various patterns of fractional h.p. motors and fans made by the Robbins & Myers Co. (United States).

THE SUN ELECTRICAL CO., LTD., 118, Charing Cross Road, W.C.2.—A priced leaflet advertising "Radiobat" h.p. dry batteries.

MR. A. MORGAN, 138, Gower Street, London, W.C.1.—Priced leaflets relating to jack-up trucks and Osram lamps.

Book Notices.—We have received a copy of the first number of *The Wireless Dealer and Manufacturer*, a shilling monthly journal edited by Mr. J. Scott-Taggart and published by the Radio Press, Ltd. The outstanding articles are: "Tendencies in Radio Design," by Major James Robinson; "Selling Radio in America," by Mr. Percy W. Harris; "Organising the British Trade," by Mr. W. Witt Burnham; "A Talk on Demonstrating," by Capt. H. J. Round; and "Price-cutting and the Remedy," by Mr. A. H. Clifford. A good deal of space is devoted to the Wireless Exhibition and to matters of general interest to wireless dealers.

"The Decimal Educator," Vol. VIII. No. 29. September, 1925. Price 6d.—Included in an unusual number of interesting articles is one on foreign currencies and others on the accuracy of weighing in early days and Egyptian mathematics. This number also contains a *résumé* of the recently issued B.O.T. report on its work under the Weight and Measures Act.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIII. September, 1925. No. 345. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"More Things that Matter, by Lord Riddell. Pp. viii + 319. London: Hodder & Stoughton, Ltd. Price 7s. 6d. net.

"Rewinding Small Motors," by D. H. Braymer and A. C. Roe. Pp. xiv + 247; figs. 210. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d.

"Fournier's Theorem and Harmonic Analysis," by A. Eagle. Pp. xiv + 178; figs. 25. London: Longmans, Green & Co. Price 9s. net.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 16th:—

Dri-ac (lettering and design). No. 458,263. Class 8. Electrical secondary cells or accumulators (not for surgical purposes) in which a non-liquid electrolyte is used.—Charles George Smith, "Woodville," Oakland Road, Cheltenham.

Ammonome. No. 460,719. All goods in Class 8.—The Paterson Engineering Co., Ltd., Windsor House, 83, Kingsway, London, W.C.2.

Electrola. No. 451,070. Class 8. Instruments and devices for the recording, reproducing, transmission, or reception of sound.—The Gramophone Co., Ltd., Hayes, Middlesex.

Spartan. No. 450,073. Class 13. Electric lamps (ordinary).—Palmer, Ferris and Co., Ltd., 63, High Holborn, London, W.C.1.

Spartanite. No. 458,715. Class 40. Goods manufactured from india-rubber and gutta-percha for use in wireless telephony. No. 458,824. Class 50. Electrical insulating substances, battery jars, vents, covers, &c.—Fuller's United Electric Works, Ltd., Woodland Works, Grove Road, Chadwell Heath, Essex.

South Wales Exhibition.—The South Wales Institute of Engineers is organising an engineering exhibition to be held at the Drill Hall, Cardiff, from November 25th to December 5th. The preliminary list of exhibitors includes the following:—Daniel Adamson & Co., Ltd., Anderson Boyes & Co., Ltd., Edward Bennis & Co., Ltd., Blackstone Engine Co., Ltd., British Arca Regulators, Ltd., British Brown, Boveri, Ltd., British Engine, Boiler and Electrical Insurance Co., Ltd., "Ceag" Miners' Supply Co., Ltd., Cowlishaw, Walker & Co., H. & T. Danks (Netherton), Ltd., Davey, Paxman & Co., Ltd., De Laval Chadburn Co., Diamond Coal Cutter Co., Ltd., Electro-Mechanical Brake Co., Ltd., Evershed & Vignoles, Ltd., Film Cooling Towers (1925), Ltd., Gent & Co., Ltd., Haslam & Stretton, Ltd., Mavor & Coulson, Ltd., Oldham and Sons, Ltd., A. Reyrolle & Co., Ltd., Switchgear & Cowans, Ltd., and Turbine Furnace Co., Ltd.

Australian Preference for British Goods.—The House of Representatives has passed the Customs Act Amendment Bill, legalising the imposition of a condition that goods, in order to enjoy full preference, must be 75 per cent. of British manufacture, and granting a preference on goods, 25 per cent. of which are of British manufacture, if the preference does not clash with established Australian industries.—*Reuter* (Melbourne).

New Italian Companies.—Among the undertakings recently organised in connection with the electrical engineering industry in Italy are the Società Italiana Porcellane Elettrotechniche Pohl, formed in Milan, with a capital of 125,000 lire; the Società di Costruzzioni Elettricita Friuli Orientale, Trieste, 1,000,000 lire; and the Società Utenti Energia Elettrica, Milan, 30,000 lire.

German Electrical Combine.—It is reported from Stuttgart that a new concern has lately been formed in that town with the title F.M.O., to effect an amalgamation of the interests of three manufacturers of electrical apparatus—C. and E. Fein, of Stuttgart; Paul Meyer, of Neu-Isenburg; and the Albert Obermoser Gesellschaft, of Bruchsal. The object is to establish a joint material purchasing and sales office and the prevention of overlapping in the classes of goods produced.

New Municipal Showrooms.—SOUTHPORT.—The offices of the Electricity Department have been transferred from Eastbank Street to the Glaciarium, Lord Street, which has been improved for the purpose. The premises include new showrooms.

SWANSEA.—On September 17th the Mayor formally opened the Electricity Department's new showrooms and offices in Oxford Street. The showrooms are arranged as a series of rooms each with its appropriate electrical equipment.

Czecho-Slovakian Company.—The West Bohemia Electricity Co. has been formed in Pilsen with a capital of approximately £74,000.

Electricity Supply Association of Ireland.—The annual meeting of this Association was held in Dublin on September 17th, when Mr. W. Hewat was elected president for the ensuing year. Among the matters discussed was the Shannon hydro-electric scheme. Mr. P. A. Spalding (Dundalk) said that while the contractors were endeavouring to pay labourers 8d. per hour, the men claimed 1s. 3d. per hour. It was estimated that 3,000 men would be employed on the scheme, and therefore the extra cost involved would be £125,000 per annum. As the carrying out of the scheme was expected to occupy three years, the total additional cost would be £375,000 for labour costs alone. Mr. Spalding asked whether the contractors or the Government would be responsible for that.

Brazilian Electrical Imports.—According to *Commerce Reports*, imports of electrical goods into the port of Rio de Janeiro during June last were considerably below normal, totalling 101 metric tons, or 819 cases. The United States and Germany, normally large suppliers of electrical goods, showed decreases as compared with the previous month's figures. The United States supplied 28 metric tons; Great Britain, 13 tons; Germany, 26 tons; the Netherlands, 14 tons; Italy, 16 tons; and other countries, 4 tons.

The Wood Market.—A timber trade correspondent writing on the present position of the wood market, says:—"In the electrical trade timber is a necessity as it is in all trades. Our own forests are so sparse that approximately nine-tenths of our wood requirements are brought from overseas. Our principal and most generally used imports are sawn softwoods, *i.e.*, pine and spruce deals, battens, scantlings and boards. Finland, Russia and Sweden, in the order named, send us the largest quantities of these, followed by Latvia, Canada, Poland, the United States, &c. Sawn softwoods are used in house construction, joinery, box and packing case work—indeed, they may be termed the 'general utility' woods, called into requisition for all kinds of work from a rabbit hutch to the carcassing of a mansion. And they are shipped to this country in almost every conceivable size for the work they have to perform. The timber market here is at present so depressed that consumers should be getting their raw material, and their clients their made-up wooden articles, more cheaply than, say, in January last. The fall in prices is due to over supplies on the market, the dull state of the staple industries of this country and their lack of call for timber, and the poor demand from Continental consuming countries. If it were not for the small boom in house-building (this is a record year for housebuilding), the north of Europe shippers would have made still heavier losses than those already entailed by them this season. Some authorities in the trade, however, believe that the market has now reached bottom; others, on the other hand, think timber may go a little lower in price yet. It is certain, however, that the foreign wood manufacturers are suffering heavy financial losses, which will mean restricting output and a general rise when opportunity permits. That is the general position to-day of our imported 'general utility' woods. These must not be confounded with hard woods—mahogany, oak, ash, walnut, &c., for the furniture and cabinet trades and for interior decorative work, nor with shipbuilding woods such as East India teak, pitch pine, &c. All these are firm in value and likely to get stronger."

A Valve-Selling "Campaign."—Following upon its scheme for stimulating the sale of "Osram" lamps, the GENERAL ELECTRIC CO., LTD., has drawn up plans for a similar "campaign" in connection with its radio valves. A brochure has been prepared for the use of sellers of these valves in which particulars are given of the publicity matter which is available, as well as details of a widespread advertising scheme.

Unemployment.—After a series of increases there was a reduction in the number of unemployed during the week ended September 7th. The total at that date was 1,345,500, 8,800 less than a week earlier, but 181,850 more than at September 8th, 1924.

Sales Engineers' Luncheon.—On Friday, September 11th, the sales engineers of the London office of Metro-Vick Supplies, Ltd., were entertained to luncheon at "Simpsons" Restaurant by their district manager, Mr. E. Myhre. The principal guests were Mr. P. F. Crinks, managing director, and Mr. A. E. Iliffe, sales manager. The luncheon was arranged to take place on the same day as the visit of M-V.S., Ltd., sales staff to the E.L.M.A. Lighting Bureau to hear a lecture on "The Shop-window Lighting Campaign." The guests were afterwards entertained at the "Victoria Palace."

Army Technical Training.—The authorities announce that there will be vacancies for between 200 and 250 boys at various military technical establishments in November next. The selection of boys for the vacancies will be made by means of a competitive examination. Among the trades which are taught are electricians' work, fitting, and radio operation.

Chinese Notes.—The official *Chinese Economic Bulletin* says that there has been an enormous decrease in the consumption of kerosene oil in Canton, the principal cause being the wider use of electricity for lighting in the city and neighbouring towns.

The Electrical Enterprise Co., Ltd., Harbin, is planning to start the construction of a tramway in the city at an estimated cost of $2,730,000. The Siemens (China) Co. is reported to have received the contract for the engineering work.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report September 22nd:—Copper (electrolytic) bars, £68, 15s. decrease; do. do. sheets, no change; do. do. wire rods, £78, 15s. decrease; do. do. h.c. wire, 9¾d., ¼d. decrease.

Messrs. James & Shakespeare report September 22nd:—No change in the prices of copper bars (best selected), sheet and rod; English pig lead, £41 5s., 30s. increase.

Messrs. Edward Till & Co. report September 22nd:—India-rubber, Para, fine, 3s. to 3s. 1d.

Limerick Dock Scheme.—The *Financial Times* reports that it is stated in Limerick that a sum of £150,000 has been guaranteed under the Trades Loan Act for carrying out the extension of Limerick docks and the construction of a western entrance. The work, which will probably be undertaken by Siemens-Schuckert, of Berlin, will provide further facilities for the docking of vessels of large tonnage.

New Belgian Companies.—Among the recently-formed Belgian companies are the following: l'Electricité Industrielle Belge, capital one million fr., for all industrial, commercial, or financial operations relative to electricity supply undertakings, &c.; the Société Co-operative pour l'Exploitation du Halage Electrique, to establish and work electric haulage on the Liége—Antwerp canal and elsewhere, and to produce and distribute electricity; and the Société d'Electricité de la Région de Malmedy (Serma), Brussels, capital 40 million fr., to develop the hydro-electric resources of the Warche.

Electrical Association for Women.—ST. HELEN'S WORKS VISIT.—On September 19th, in spite of the very bad weather, a large party of members visited the St. Helen's Cable and Rubber Co., Slough, and was very interested in seeing the rubber as it was received in its raw state from Central America, and the large number of operations that were necessary before it was finally ready to be used as cable covering. Tea was taken at the canteen, when a vote of thanks was proposed by Mrs. Llewelyn Atkinson to Mr. Brooking and his staff for their kindness in giving up a Saturday afternoon to show the members of the E.A.W. round their works. Before leaving each member of the party was presented with a St. Helen's hot-water bottle. This was the first visit of the E.A.W. to a cable factory.

Lighting and Power Notes.

Ayrshire.—ELECTRICITY SUPPLY.—Under the Ayrshire Electricity Board scheme an electricity supply is now being given to Dalmellington by the Dalmellington Iron Co., Ltd., from its power station. The company is now carrying out an installation at Burnfoothill and Lethanhill.

Blackhall (Co. Durham).—STREET LIGHTING.—After lighting the streets of the district free of cost since the opening of the colliery 12 years ago, Horden Collieries, Ltd., has informed the residents that it will be necessary in future to make a charge of £3 per lamp per annum for 139 lamps. This includes the cost of extra installations and maintenance.

Brazil.—SAO PAULO POWER SHORTAGE.—According to *Commerce Reports*, conditions in Sao Paulo, Brazil, have become more serious, due to continued power shortage, which has reduced the output of factories to approximately one-half their normal production. It is stated that work on the new hydro-electric plant at Rasgao is progressing satisfactorily, and construction work on the Cubatao plant, near Santos, is also going forward, and it is expected that within one year Sao Paulo will receive power from this source.

Canada.—ELECTRICAL DEVELOPMENT.—The fifth unit of the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., Vancouver, B.C., has been completed. The addition of this 25,000-h.p. unit completes the enlargement of the Stave Falls plant, which now has a total capacity of 75,000 h.p. The plant, originally built by the Western Power Company, consisted of three units with a capacity of 39,000 h.p. when it was taken over by the British Columbia Electric Railway Company at the end of 1920. The latter installed a fourth unit bringing the plant's capacity up to 52,000 h.p.

The town of Antigonish, N.S., is considering installing a municipal electrical plant. The cost will be about $60,000.—*Electrical News.*

Chester.—YEAR'S WORKING.—The report on the working of the city electricity undertaking (engineer, Mr. S. E. Britton) for the year ended March 31st last, shows a total revenue of £57,048, as compared with £54,218 in the preceding year. Working expenses totalled £30,077, as against £23,840, leaving a gross surplus of £26,972 (£30,378), to which was added a grant from the Unemployment Grants Committee of £215, making a total of £27,187. Capital charges absorbed £17,547, and there was a net profit of £9,639. The result of the previous year's working was a profit of £14,704. The capital expenditure amounted to £37,482, and included £10,007 for property in Northgate Street, £9,137 for mains, and £8,962 for plant and machinery. The electrical energy sold increased from 4,238,246 to 4,883,378 kWh, and the maximum supply demanded from 2,710 to 3,191 kW.

Continental.—JUGO-SLAVIA.—A new 15,000-h.p. turbo-generator is being added to the Faal hydro-electric power station near Marburg. Work is also in hand on the erection of a permanent 10,000-V transmission line, in place of the temporary one at present connecting the plant with the nitrogen factory at Maria-Rast.

SPAIN.—La Sociedad Riegos y Fuerza del Ebro, of Barcelona, has decided to extend the plant at its Camarasa hydro-electric power station by the addition of a 14,060-kW alternator, three 4,700-kW transformers, four 8,333-kW transformers, and two synchronous condensers of 5,000- and 2,000-kW capacity respectively. The contract for the material has been placed with the General Electric Co. through its Spanish representative, the Sociedad Iberica de Construcciones Electricas, of Bilbao.

AUSTRIA.—The Teigitsch hydro-electric power station which has been erected by the Steirischen Wasserkraft und Elektricitats Gesellschaft and at present is equipped with two 13,000-h.p. sets, was recently put in operation. Electricity is being supplied at 60,000 V to the town of Gratz and Central Styria, and when a third 13,000-h.p. set is installed and the necessary transmission lines completed, part of the power will be reserved for industrial establishments in the Murz Valley and other districts of lower Austria.

GERMANY.—The Inn hydro-electric works was completed on September 6th. It is situated in the vicinity of Muhldorf and has been established by the Government of the Reich, by Bavaria, and by three large firms in the electrical and chemical industries. The works is intended to supply electrical energy for the production of aluminium and nitrogen. The constructional works have extended over five years. At present the power house has in operation seven sets, each of 5,750 kW, for supplying the aluminium smelting furnaces, and eight units each of 8,200 kW for the production of nitrogen, the total machinery installed, including a small generator, being 128,000 h.p. The average production per annum is estimated at 500,000,000 kWh. It is stated that the output of the works will amount to 10,000 tons of aluminium and 20,000 tons of nitrogen per annum.

DENMARK.—According to a recently-issued Government report there were 95 municipal central electricity stations, 40 other large stations, and 374 small country stations in operation in Denmark at the end of 1923. The total power available was 190,595 h.p., of which 101,910 h.p. was supplied by steam engines, 62,684 h.p. by Diesel plant, and the balance by miscellaneous types of machinery. The production of electricity during the year in question amounted to 194 million kW, of which nearly 80 millions was required for Copenhagen alone, where the generating stations have a capacity of 53,000 h.p. The number of electric lamps and motors in use in Denmark represented 277,000 kW and 441,000 kW respectively.

Dalkeith.—PURCHASE OF UNDERTAKING.—It was announced at a meeting of the Town Council on September 14th, that the Electric Supply Corporation, Ltd., had decided to accept the Council's offer of £18,000 for the purchase of the local electricity undertaking.

Darlington.—OPPOSITION TO ORDER.—The Rural District Council is to lodge a protest against the Darlington Corporation Electricity Extension Order unless the Corporation is prepared to include in the area of compulsory service the parishes of Haughton-le-Skerne, Blackwell, and Croft, and to exclude nine parishes which the Rural Council considers can be more favourably served by the Cleveland and Durham Electric Power Company. The Corporation has, so far, declined to accede to the Rural Council's request, and does not agree that the minimum price per kWh should be reduced from 1s. to 10d.

Dover.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £3,000 for mains.

Easingwold (Yorks.).—STREET LIGHTING.—After considering terms for street lighting offered by the Easingwold Gas, Light & Coke Company, Ltd., and by Messrs. John Charles Bannister & Co., Ltd., from Easingwold electric power station, the Urban District Council has decided in favour of the electric lighting offer. Both undertakings offered the lighting at £2 per lamp during the period of the lighting season, but the electrical offer included all maintenance costs.

Grimsby.—NEW PLANT.—Owing to the increased demand for electrical energy required for the tramway undertaking, it is proposed to move the existing converter used for this purpose to West Marsh sub-station, and to install a new converter with a capacity of from 400 to 500 kW. The cost of the scheme is estimated at £2,700, and application is to be made for sanction to a loan to cover the cost.

Hamilton.—PURCHASE OF UNDERTAKING.—At a recent meeting of the Town Council the Electric Lighting Committee reported on negotiations with Messrs. Edmundson's Electricity Corporation, Ltd., regarding the proposals for the taking over of the electricity undertaking by the Council. As to the sum to be paid by the Council for loss of profits between January 1st and May 15th next, the proportion based on last year's profits was about £1,500, but it was arranged with Mr. Rye, general manager of the company, that £1,400 should be paid by the Council on January 1st next, and that the undertaking should be taken over as from that date. The report was adopted.

Haslingden.—ELECTRICITY IN BULK.—The Corporation has decided to ask the Accrington Corporation to reconsider its terms for supplying electricity in bulk.

Hawaii.—WATER-POWER RESOURCES.—According to the *Electrical World* the Department of the Interior has prepared an estimate of the potential water-power of Hawaii based on

a study of the flow and the fall of the streams. This potential power is estimated at 174,000 h.p. for 50 per cent. of the time and 72,000 h.p. for 90 per cent. of the time. The latter is divided among the islands as follows: Kauai, 34,900 h.p.; Oahu, 5,300 h.p.; Molokai, 1,700 h.p.; Maui, 15,800 h.p.; Hawaii, 14,700 h.p. The rated capacity of the waterwheels and turbines now in use is about 25,000 h.p.

Hayward's Heath.—SPECIAL ORDER.—Application is being made by Mr. A. A. Hunt, engineer of the Burgess Hill and District Electric Supply Co., Ltd., and the Haywards Heath and District Electric Supply Co., Ltd., for a Special Order to supply electricity in Hurstpierpoint, Hassocks, Keymer, and Ditchling. It is proposed to erect transmission lines and obtain a bulk supply from Brighton Corporation.

India.—TRICHINOPOLY ELECTRICITY SCHEME.—The Government of Madras has authorised the Trichinopoly Electric Power Co. to commence operations and the company has been actively proceeding with the survey, demarcation and acquisition of the lands necessary, for the water-power works on the Kollimlais in order that an initial supply of 500 h.p. may be made available at Trichinopoly in the course of next year. The company will complete this work shortly and afterwards carry out the demarcation and survey of the conduit channel and emergency reservoir.—*Indian Engineering.*

Irish Free State.—CLONMEL (CO. TIPPERARY).—The electricity scheme which has been provided at a cost of £12,500, was formally inaugurated on September 10th. Lamps of from 100 to 400 candle-power have been installed for street lighting and the scheme is working satisfactorily. Messrs. Tierney and Co., Dublin, were the engineers. The power house was built by Messrs. Roche, Morrissey & Kennedy, Clonmel; the Siemens-Schuckertwerke, Berlin, supplied the alternators, the Western Electric Company the switchgear; Messrs. Ruston and Hornsby, Lincoln, the three engines; and the Irish Electricity Supply Company, Dublin, the distribution plant. The system is so arranged as to fit in with the Shannon scheme. Some 120 business and private houses are at present receiving a supply, and it is anticipated this number will be greatly increased before the end of the year.

Keighley.—ELECTRICITY EXTENSIONS.—On September 19th, Mr. Philip Snowden, M.P., formally inaugurated extensions at the Corporation electricity station, the chief feature of which is a new 5,000-kW generating set, bringing the capacity of the plant to 15,000 kW. Mr. Harry Webber, the borough electrical engineer, in the course of the 24th annual report on the undertaking, states that this is by far the largest extension made at any time by the department. In June, 1902, after the first fifteen months' running, there were 92 consumers, in 1920 there were 967, and at the end of last March there were 2,031 consumers, who took 10,340,784 kWh. Last year's revenue was £74,069, as compared with £1,409 in the first fifteen months' period. The Corporation is still developing the electricity supply in out-districts.

Kirkintilloch.—ELECTRICITY SCHEME.—The Strathclyde Electrical Supply Co., Ltd., has given statutory notice to the Town Council of its intention to exercise the powers under the Kirkintilloch and District Electricity Supply Order and to carry out the necessary work. A cable has been brought into the town and a sub-station is to be erected.

Leeds.—"ALL-ELECTRIC" HOUSES.—The Electricity Committee proposes to contribute £10 per house towards the cost of wiring the new houses which it is surging the Improvements Committee to equip, experimentally, with electrical fittings. This offer, it is stated, extends to a block of fifty of the new dwellings which the Corporation has in contemplation. It is intended that electrical appliances should be provided for cooking, lighting, and washing. The scheme is now being considered by the Improvements Committee.

London.—ISLINGTON.—The Electricity Committee has approved an estimate of £15,000 for replacing with paper-insulated lead-covered cables the rubber-insulated cables at present in use. Some of these cables were laid down when the electricity supply was first commenced.

ST. PANCRAS.—The Electricity Committee has received the approval of the Unemployment Grants Committee to a grant of 50 per cent. of the interest on loans raised to meet the expenditure on schemes not exceeding £18,400 for linking-up the St. Pancras and Islington power stations, the re-arrangement of mains in the southern area of the borough, and the installation of h.p. mains from King's Road generating station to the Highgate sub-stations.

The Committee has requested the chief electrical engineer to report on the possibility of converting the whole of the street lamps from gas to electricity for the purpose of a grant under the Unemployment Relief Scheme.

Lowestoft.—ELECTRICITY IN BULK.—The Electricity Committee is negotiating with the Great Yarmouth Corporation respecting a bulk supply of electricity from Yarmouth.

EXTENSION OF SUPPLY.—The Electricity Committee is arranging to give a supply of electricity to Pakefield, subject to its securing the necessary fringe Order for the purpose.

Maldon (Essex).—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising Messrs. J. Sadd & Sons, Ltd., to supply electricity in the urban district and certain parishes in the rural district of Maldon.

Mexico.—HYDRO-ELECTRIC DEVELOPMENT.—*Commerce Reports* states that a contract has been entered into between an electric power company and the Mexican Government fixing the terms of a concession granted to that company for the use of the Conchos River for generating hydro-electric power. The present contract, which supersedes three other contracts, authorises the company to construct a dam, 70 metres high, on the Conchos River, and the necessary hydraulic works to provide power; and a dam and the necessary hydraulic works to utilise the waters of the Rio Conchos. The duration of this concession will be 85 years, beginning December 10th, 1909.

Northern Ireland.—BALLYSHANNON (CO. DONEGAL).—The Town Commissioners have accepted the offer of Messrs. Myles and Co. for the electric lighting of the main streets.

Oxenhope.—ELECTRICITY SUPPLY.—The Urban District Council, on September 11th, decided to ask Keighley Corporation to provide a supply of electricity to the district.

Peebles.—ELECTRICITY SUPPLY.—The Town Council is to confer with the Galashiels and District Electric Supply Company regarding a supply of electricity for the town.

Preston.—STREET LIGHTING.—The Town Council has decided to illuminate all tramway routes and streets where electric mains are laid by electricity, and application is to be made for sanction to borrow £15,800 for the work.

LOANS.—The Electricity Committee has recommended that application be made to the Electricity Commissioners for sanction to borrow £3,814 for the purchase of a rotary converter and switchgear, and £5,000 for meters.

ELECTRICITY IN BULK.—The Committee reports the receipt of a letter from the Electricity Commissioners announcing their approval of an agreement between the Corporation and the Lancashire Electric Power Co. for a bulk supply of electricity to Leyland, &c.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

ST. ALBANS.—*North Metropolitan Electric Power Supply Co.*—Lighting: Flat rate from 7d. to 6d. per kWh; maximum demand rate, from 10d. and 2d. to 10d. and 1½d. per kWh. Heating and cooking: Flat rate from 2½d. to 2d. per kWh. Lighting, heating and cooking, annual service rate: The meter rental of 2s. 6d. per quarter to be discontinued.

EDMONTON.—*North Metropolitan Electric Power Supply Co.*—Lighting: Flat rate from 6d. to 5½d. per kWh; maximum demand rate, from 9d. and 2d. to 10d. and 1d. per kWh. Heating and cooking: From 2d. to 1½d. per kWh. The surcharge of 10 per cent. on motor and industrial power rates is to be discontinued.

TUNBRIDGE WELLS.—Lighting: Flat rate, 4½d. per kWh. Heating, cooking and power: Flat rate, 1d. per kWh, or at the option of the consumer, a fixed charge of 18s. per annum for each living room and hall, and 6s. per annum for other rooms, plus ¾d. per kWh for electricity consumed, or a fixed annual charge of £1 for houses of the rateable value of £10 or under, or a fixed charge of 10 per cent. of the rateable value for houses rated at over £10, plus in each ¾d. per kWh for electricity consumed.

MANSFIELD.—Lighting: From 7d. to 6½d. per kWh. Power: From 3½d. to 3d. per kWh.

Scarborough.—PURCHASE OF UNDERTAKING.—The proposal of the Town Council to purchase the electricity supply undertaking of the Scarborough Electric Supply Co., Ltd., as from December 31st next has been agreed to by the company.

Stirling.—YEAR'S WORKING.—The accounts of the burgh electricity undertaking (engineer, Mr. W. R. Murray) for the year ended May 15th last, record a total revenue of £16,310, as compared with £14,284 in the preceding year. Working expenses amounted to £11,324, as against £9,033, leaving a gross profit of £4,986 (£5,251), to which was added a profit on hire-purchase motors, making a total of £4,968. This was distributed as follows: Interest on and instalment of principal of money borrowed, £2,913; sinking fund, £1,394; taxes and bad debts, £681. The sales of electrical energy increased from 843,043 to 986,180 kWh, and the maximum supply demanded from 600 to 640 kW.

Straits Settlements.—PENANG.—According to *Commerce Reports*, the submarine cables which are to supply Penang, Straits Settlements, with current from the new power station at Prai are said to be the longest submarine power cables that have been manufactured in one length. Each cable is 4¼ miles long, and consists of six conductors, each of 0.075 sq. in. sectional area, forming a three-phase feeder of 0.15 sq. in. sectional area of conductor per phase. They are four inches in diameter, paper insulated, lead sheathed and armoured. The total weight of the submarine section is 270 tons. The normal pressure of these feeders will be 12,400 V, 50 cycles, and the test pressure will be 28,000 V.

Tanfield.—INAUGURATION OF SUB-STATION.—The new sub-station which has been erected by the Urban District Council was formally inaugurated on September 23rd.

Winchcombe.—ELECTRICITY SCHEME.—Mr. John Atkins, electrical engineer, of Tewkesbury, proposes to carry out an electric lighting scheme for the town. The cost of the scheme is about £4,380, towards which £2,000 has been promised, and he proposes to supply electricity at a charge of 1s. per kWh. If the necessary approval and support are forthcoming a supply of electricity will be available early next year.

Yarmouth.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £120,000 for extensions to the generating station, sub-stations, mains, and plant. The extensions include the installation of a 3,000-kW turbo-generator.

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Electricity Supply in Salford.

The Agecroft Power Station.

THE Royal Borough of Salford, though it takes just pride in its ancient Charter (dating from about 1230 A.D.), has advanced with the times, and will not brook dependence on others for the supply of that essentially modern commodity—electrical energy. Thirty years ago it commenced operations in a small way, with a 360-kW single-phase a.c. plant, of which a description appeared in our pages at the time. The distribution pressure was 3,300 volts, reduced by house transformers to 100 volts. In 1897 the central district was changed to direct-current supply at 220 and 440 volts, and the Frederick Road station, described in our issue of June 27th, 1902, was built for a capacity of 6,400 kW. Later on, turbo-generators of 3,000 kW were installed; in 1912 a bulk supply of 2,000 kW was obtained from the Lancashire Electric Power Co.; and in 1914 a turbo-alternator of 5,000 kW was added, followed by two others of the same capacity in 1915 and 1917, the three-phase system of transmission at 6,600 volts being adopted. The output capacity of the plant on the Frederick Road site was thus brought up to 18,000 kW. In 1918 the contract with the Power Co. was terminated, and a bulk supply of 5,000 kW was obtained from the Manchester Corporation, at 33,000 volts—the highest pressure used up to that date for underground transmission; the cables were put to work in October, 1919, and have proved entirely satisfactory. In 1920 a fourth generating set was installed, but it was decided to build a new power station on the River Irwell at Agecroft, and a scheme was prepared for a station of 50,000 kW initial capacity by Mr. J. A. Robertson, then borough electrical engineer, which was approved by the Council and the Electricity Commissioners in 1922. The main contracts were placed in September of that year; the first three generating sets were to have a total capacity of 37,500 kW, and the design provided for extensions up to 100,000 kW.

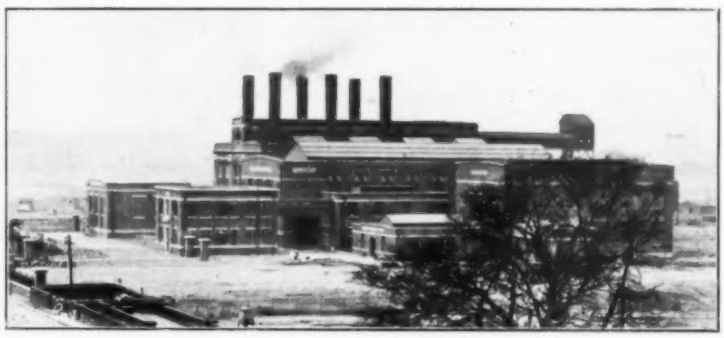

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Fig. 1.—Exterior of Agecroft Power Station.

While the station is intended primarily to serve the borough of Salford, it is also one of the capital stations scheduled in the South-East Lancashire Electricity Scheme, and will be linked with other capital stations to supply districts outside the borough.

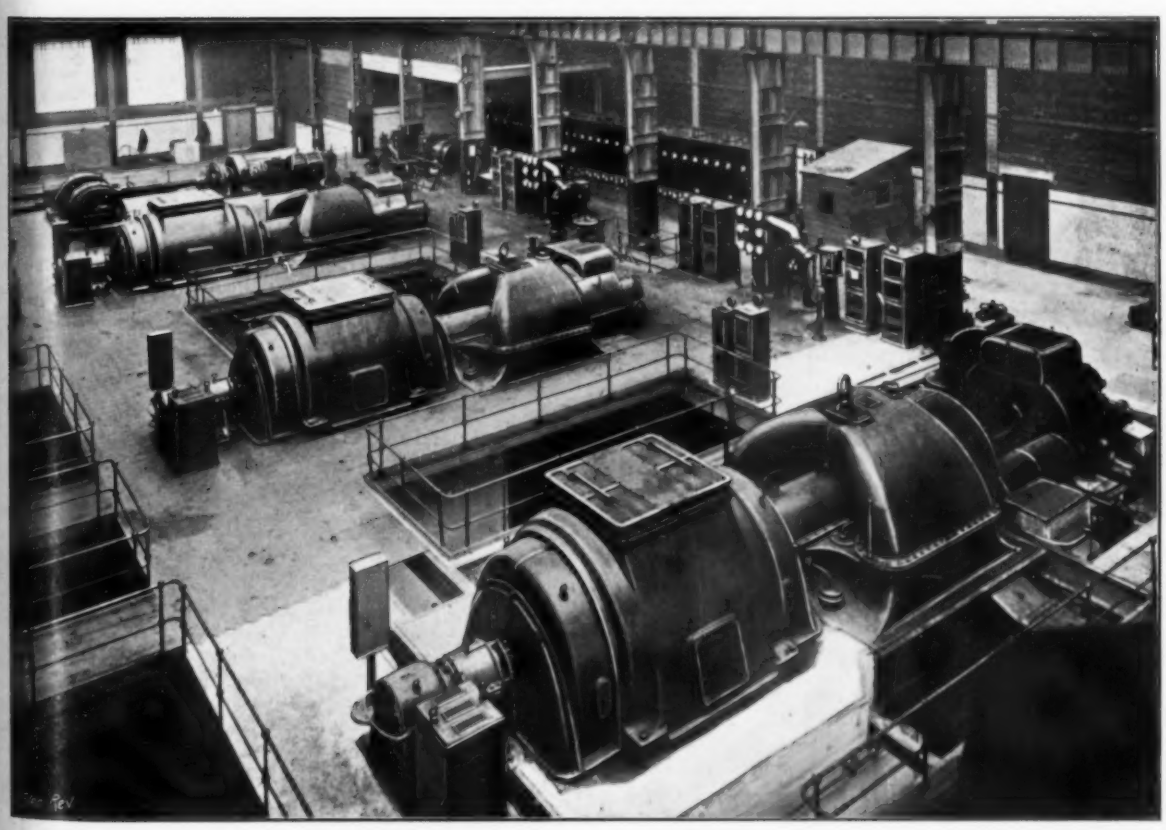

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Fig. 2.—Interior of Engine Room.

The site, which covers 65 acres, is bounded on the east by the River Irwell, from which ample supplies of condensing water can be obtained; on the west it adjoins the Manchester, Bolton and Bury Canal, and the main

railway line between Bolton and Manchester. There are several large collieries in the vicinity from which supplies of coal can be obtained by road. The low-lying north portion of the site provides ample ground for the disposal of ashes. A thick bed of sandstone

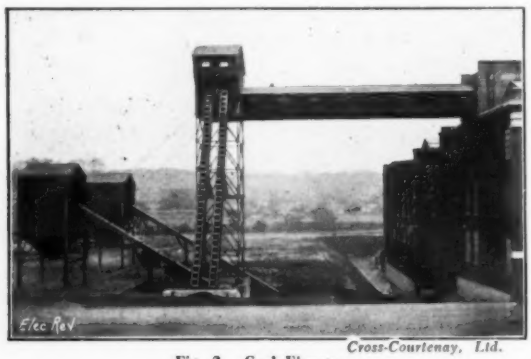

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Fig. 3.—Coal Elevator.

extends over the site at a depth of 12 to 15 feet, affording good foundations. The geographical position is suitable for linking-up with other large stations, the distance from the Manchester Barton station being about five miles, from Manchester Stuart Street station about six miles, and from the Radcliffe power station of the Lancashire Electric Power Co. about 4½ miles.

Condensing water is taken from the River Irwell at a point about 150 yards from the power house, whence it is conveyed through a tunnel 8 ft. 6 in. in diameter, bored through the rock, to the basement of the turbine house. After passing through the condensers, the water is returned by way of a junction chamber, through a similar tunnel to a spillway lower down the river. A screening chamber at the inlet is equipped with four circular motor-driven screens each

Cross-Courtenay, Ltd.

Fig. 5.—Boiler House.

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Fig. 4.—Belt Conveyor.

27 ft. in diameter, supplied by Messrs. F. W. Brackett and Co. Separate compartments are provided, controlled by penstocks, so that any screen may be closed down for examination or repair.

To guard against periods of abnormal drought, four cooling towers have been erected by the Premier Cooling Co. to the north of the power station; they are capable of cooling 1,200,000 gallons of water per hour from 100 deg. to 80 deg. F., and are erected on concrete

Cross-Courtenay, Ltd.

Fig. 6.—Cooling Towers.

piers in the water-storage reservoir, which is capable of storing 2,500,000 gallons of water. When it is desired to bring the cooling towers into operation, the penstocks on the discharge side of the junction chamber can be partially or wholly closed and water pumped back through duplicate pipe lines over the cooling towers. The flow of water from the reservoir is regulated by two electrically-operated penstocks controlled from the power station. A water tunnel has been bored between the reservoir and a junction chamber on the main tunnel between the screening chamber and the power house. The water tunnels throughout are double brick lined, and the branches to the main condensers are of cast iron.

The canal is situated between the railway and the power-station site, and in view of the expenditure neces-

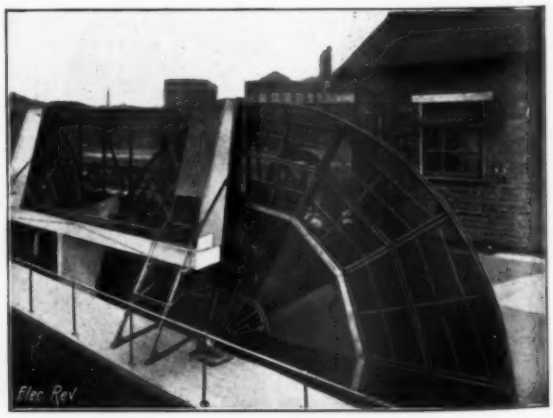

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Fig. 7.—Part of the Screening Plant.

sary to construct bridges for sidings over the canal, it was decided to unload coal from both railway and canal at the Clifton Junction siding about half a mile away, and convey the coal by light railway to the power house.

Rail-borne coal is unloaded from a railway siding by an electrically-operated wagon tippler, which is combined with a coal-weighing machine, and delivers to a belt conveyor, whence it is discharged to a common receiving hopper on the canal bank. Canal-borne coal is unloaded by a jib crane travelling on rails on the canal bank, and is delivered to the receiving hopper. From this point a second belt conveyor transports the coal over the canal and delivers it into the dispatching hoppers, which discharge into steel trucks of about 2½ tons capacity. The trucks are then hauled in trainloads to the power house by an electric locomotive, supplied with direct current from overhead trolley wires at 220 volts. The capacity of the system is 80 tons per hour.

At the power house the coal is emptied to the main receiving hopper and elevated by duplicate bucket conveyors to horizontal belt conveyors, which extend over the full length of the overhead bunkers, and also provide for the additional bunkers which will be required when an extension is made to the boiler house.

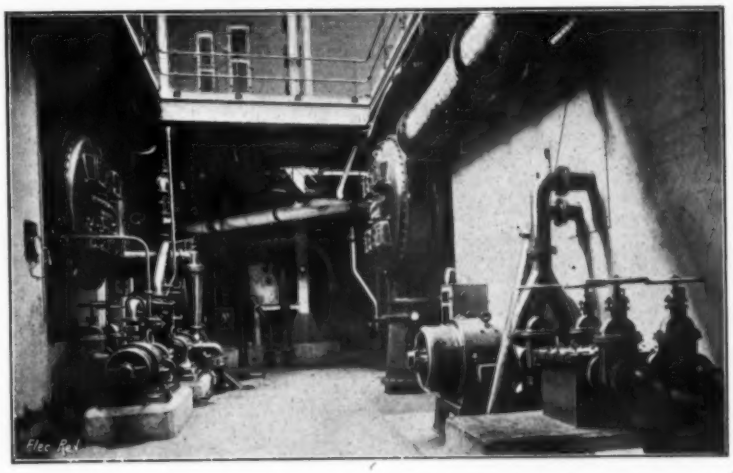

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Fig. 10.—Basement of Engine Room.

from the light railway and empties them on to the stack. When reclaiming, a 2-ton grab is used which delivers coal from the stack to the light wagons. The system of weighing the coal permits of a complete check throughout, including coal taken from the storage ground.

The removal of ashes from the boiler-house basement is effected by wet conveyors comprising chain-driven links immersed in water-filled troughs, which receive the ashes from the boiler furnaces and deliver to enclosed bunkers at the end of the boiler house.

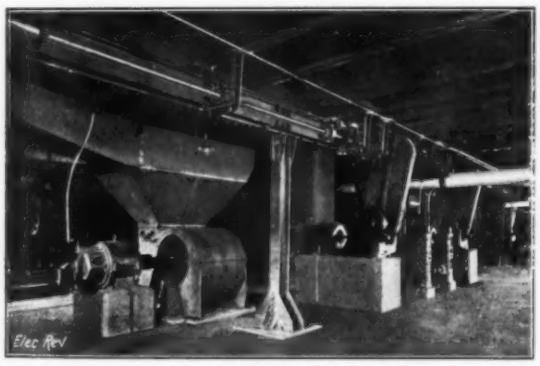

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Fig. 8.—Basement of Boiler House.

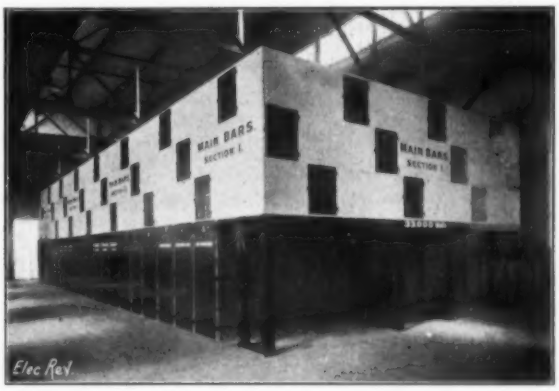

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Fig. 11.—Bus-bar Room.

To the north of the power station branches from the light railway have been constructed to permit delivery of coal direct to the storage ground. To stack and reclaim coal a jib crane, of 30 ft. radius, and travelling on a standard-gauge railway, is employed. The crane lifts the wagons, which are provided with flap doors,

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Fig. 9.—Control Room.

At present motor wagons are employed for the removal of ashes to the adjoining tip, but it is intended to utilise the light railway system for this purpose, and gradually to fill up the whole of the low-lying ground to the north of the site.

The main portion of the buildings consists of two bays—the turbine house and boiler house. The switch house is a separate building about 20 ft. from the turbine house, the space between being occupied by the 6,600/33,000-volt step-up transformers. The main buildings are of steel framework with brick filling, the external face of the walls having a dressing of Accrington brick and artificial stone. Two detached blocks provide office accommodation and workshops and stores.

The boiler house is 162 ft. long, 82 ft. wide, and 87 ft. in total height. At present six boilers have been installed, out of eight for which accommodation has been provided. The boilers are of the Babcock & Wilcox

marine cross-drum type, each rated at 65,000 lb. evaporation per hour when fired with coal having a

Cross Courtenay, Ltd.

Fig. 12.—Battery Room.

calorific value of 10,500 B.th.u. The overload capacity is 78,000 lb. per hour for two hours. Each boiler unit is complete in itself with economiser, superheater, forced and induced draught plant, and steel chimney.

The plant is constructed for a normal working steam pressure of 325 lb. per sq. in., and the superheaters raise the temperature of the steam to 720 deg. F. at the stop valve. The heating surface per unit is 9,234 sq. ft., and the economiser heating surface 7,460 sq. ft. Diamond soot blowers are fitted to each boiler. A complete set of measuring instruments, including CO_2 recorders, draught gauges, &c., is provided for each unit, and Lea coal meters are fitted to each stoker.

Three of the boilers are fitted with Babcock & Wilcox compartment-type chain-grate stokers, driven from a shaft in the basement. The remaining three boilers are equipped with travelling grates of the Underfeed stoker type. In both cases the grate area per unit is 340 sq. ft.

The boiler feed pumps are situated in the turbine house basement, and comprise two steam turbine-driven pumps of the Weir type, and two electrically - driven variable - speed pumps by Messrs. Mather & Platt. Each pump is capable of delivering 24,000 gallons of water per hour against the maximum boiler pressure. The steam and feed piping is laid out on the unit system, with interconnecting valves between the various sections. The whole of the boiler-house plant, feed pumps, and steam and water piping has been supplied by Messrs. Babcock and Wilcox, Ltd. The turbine house is 194 ft. in length by 90 ft. wide and 75 ft. in height, and includes a loading bay at the permanent end of the building. Three turbo-alternators have been installed, and space is provided for a fourth set. Each set is of 12,500 kW capacity at 0.9 power factor when delivering three-phase energy at 6,600 volts, 50 periods, and running at 3,000 r.p.m.

Turbines Nos. 1 and 2 are of single-cylinder design, embodying the Baumann multi-exhaust stages. During the manufacture of the first two sets, it was decided to construct No. 3 turbine as a two-cylinder machine, and to incorporate certain improvements. All three turbines are designed so that no cast-iron parts are exposed to high-temperature steam. They are fitted with the usual over-speed safety devices and oil relays for operating the valve gear.

A special arrangement of oil filtering and oil storage has been provided for the turbo sets. Each set is equipped with a Fox patent oil filter capable of dealing with 100 gallons per hour, and a general storage tank is fitted in the basement, a pump being arranged on the tank with selector valves by which make-up oil can be pumped to any turbo set.

The alternators represent the best modern practice. The stator frame is an iron casting in one piece with an air discharge outlet at the top and bottom. The windings are of the concentric type, ample bracing being provided. Ventilation is effected by air forced through the machine by fans on the rotor and also by a separately-driven blower. Air cooling is on the closed-circuit system, the coolers being situated directly under the alternators.

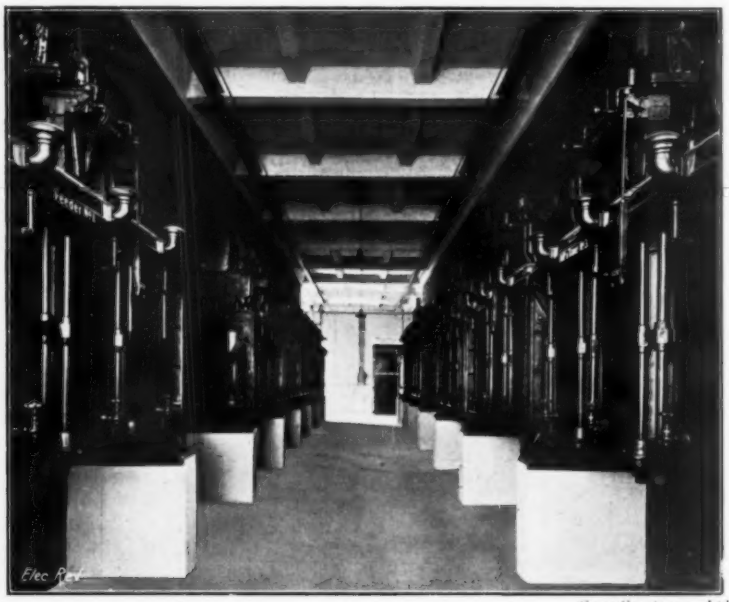

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Fig. 13.—Oil Switchgear: 33,000-Volt Circuit Breakers, without Cubicles.

Each main condenser has a cooling surface of 13,000 sq. ft., and is capable of giving a vacuum of 29.05 in. with a barometric pressure of 30 in., when supplied with 11,000 gallons per minute of circulating water at 53 deg. F. The auxiliaries are driven by d.c., 220-volt motors, and comprise two circulating water pumps for each set, each capable of delivering 8,800 gallons per minute against a total head of

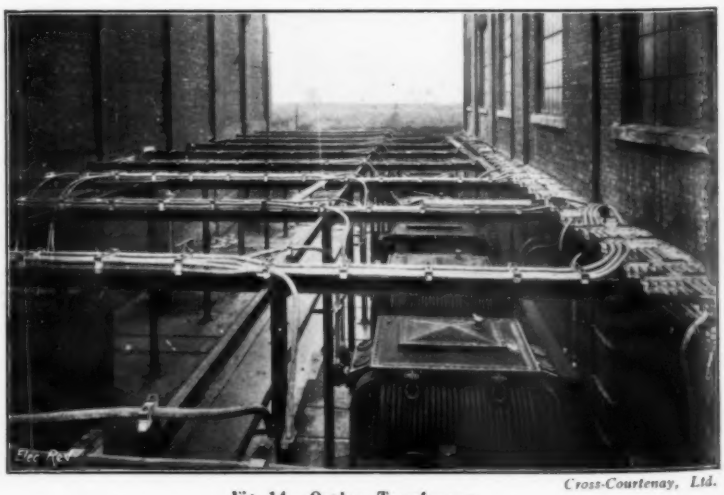

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Fig. 14.—Outdoor Transformers.

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30 ft. One motor-driven air pump of the Le Blanc type coupled in tandem with an extraction pump is provided for each set, and a two-stage steam air ejector is employed as a stand-by with a separately-driven extraction pump. It will be seen that the auxiliary plant is completely duplicated throughout.

The boiler feed water is dealt with by a completely closed system. The condensate is pumped through an integral feed-water heater and a Venturi meter into a bus main supplying the boiler feed pumps, or alternatively it can be by-passed into a special bus main connected to measuring tanks for test purposes. Above the bus main there are special surge tanks which maintain a constant pressure head on the feed pump suction. The make-up water is controlled by a ball valve which supplies direct to the condenser. Special arrangements are provided to furnish a full supply to the feed pumps in the event of an interruption of the flow of the condensate.

(To be concluded.)

Tramway and Railway Notes.

Blackpool.—TRAMWAY EXTENSIONS.—The improvements authorised by the Corporation's new Parliamentary Act include the extension of the new South Shore Promenade tramway to join the St. Annes line in Squires Gate Lane, linking up the Promenade and Fleetwood routes by a line along Queen's Square and Queen Street, a new line from Queen Street to Abingdon Street, and new lines linking up the Blundell Street depôt with Lytham Road.

Continental.—POLAND.—The construction of the first interurban electric tramway line between Warsaw and Zyrardow, a distance of 15 miles, which is being financed by British capital, is progressing rapidly. It is hoped to open it for traffic in December. The rolling stock, which has been manufactured in Great Britain, will arrive next month.—*Reuter* (Warsaw).

GERMANY.—The scheme which was first brought forward 20 years ago for the construction of an electric railway in Rhenish Westphalia has been revived by the formation by eleven towns in the district of a "study company" to which a concession has been granted for the carrying out of the project. In its present form the scheme contemplates the construction of a main line from Cologne-Dortmund, *via* Dusseldorf, Duisburg, and Essen to Bochum. It is estimated that the building of the lines would occupy a period of four years and involve an expenditure of £17,600,000. The Reich railway authorities have withdrawn from the scheme.

ITALY.—The Italian Government has sanctioned the expenditure of 60,000,000 lire on the electrification of the Bolzano-Brennero line (Trentino), and work will commence shortly.—*Reuter's Trade Service* (Milan).

THE TYROL.—An arrangement has recently been completed, according to *Die Wasserwirthschaft*, between the Austrian State Railway authorities and the Tiroler Wasserkraftwerke Gesellschaft, whereby the latter will, from the winter of 1927-28, supply from the Achen Lake hydro-electric power station, at present in course of construction, the electrical energy necessary for the operation of the Innsbruck-Brenner, Innsbruck-Kufstein, and Worgl-Saalfelden railways. It is stated that the contract calls for the supply of 20 million kWh per year, which represents between 25 and 40 per cent. of the output of the Achen Lake plant.

Heywood.—NEW ROUTES.—Having received from the Manchester Corporation tramway manager plans of the suggested tramway route from Hebers to Heywood, the Electricity and Tramways Committee has decided to make representations for a double line to be laid in Middleton Road and Coronation Avenue.

Newcastle-under-Lyme.—ABANDONMENT OF ROUTE.—The Potteries Electric Traction Co., Ltd., has given notice to the Rural District Council of its intention to apply to the Ministry of Transport for an Order to abandon certain tramways, including the Chesterton and Silverdale lines, which are mainly in the Council's area.

Oldham.—YEAR'S WORKING.—We have received from Mr. W. Chamberlain, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 25th last. The total revenue amounted to £215,615, as compared with £219,892 in 1923-24. Working expenditure was £178,852, as against £176,985, leaving a gross profit of £36,763 (£42,907). To this was added interest on investments, &c., making a total of £42,054. After providing for capital charges and rent of leased lines, a net surplus of £3,835 remained, as compared with £9,388 in the preceding year. The capital expenditure amounted to £22,750, the chief item being £16,490 on tramcars. The number of passengers carried increased from 33,410,961 to 36,364,299, and the number of car-miles run from 2,620,805 to 2,654,196. The total revenue per car-mile fell from 20.137d. to 19.496d. During the year powers were obtained to operate a system of railless cars between Oldham and Ashton-under-Lyne.

Scarborough.—PURCHASE OPTION NOT EXERCISED.—The town clerk recently drew the attention of the Corporation to the fact that the option of purchase by the Corporation of the Scarborough tramway undertaking might be exercised in 1926. The Council has decided not to exercise the option of purchase.

Telegraph and Telephone Notes.

China.—RADIO RIGHTS DEADLOCK.—The Washington correspondent of *The Times* reports that the question of the future development of radio communication in China and of the conflicting claims which arise out of the contracts between the Chinese Government and American and Japanese interests is still unsolved, and it appears as if no agreement can be reached before the holding of the conference on tariff questions next month. The Chinese proposal was to create a radio system with the aid of American and Japanese interests, but as this involved the cancellation of existing agreements with these groups, there was considerable opposition to it. A solution may be found in the formation of a consortium in which Great Britain and France would also be concerned.

Esthonia.—THE REVAL TELEPHONE SYSTEM.—It is reported that the telephone system of the capital, Reval, is to be modernised by the installation of a 10,000-line exchange. The estimated cost is given as 170 million Estmarks, and it is proposed to commence the work next year, 54 million marks being allocated to it in the Budget for that year.

France.—STRIKE.—All telegraph and telephone communication between London and Paris ceased owing to a strike of Paris operators, which took place just before noon on September 21st, when the operators left their instruments. The staffs in Paris and the provinces came out on strike for two hours by order of their trade union, to protest against the decision of the Salaries Commission in giving the maximum salary of 12,000 francs to schoolmistresses while women telegraphists and telephonists were given 9,200 francs. The strike commenced at eleven o'clock and lasted until one o'clock.

The Telephone Service.—The latest Post Office statistics for the whole country show that the increase in the number of telephones for the last quarter was 29,678, or 2.3 per cent. This figure is rather lower than that for the two previous quarters. While the volume of traffic continues to increase, as a result of connecting up new subscribers, the calling rate per line shows a tendency to fall. The number of trunk calls made during one month was 6,699,876, an increase of 580,9[illegible] calls, or 9.5 per cent. more than the figure for the corresponding month last year. The average number of calls made per working day was 273,464—the highest on record.

STREET KIOSKS.—Public street telephone kiosks, the first in the town, are about to be erected in several places in Barrow-in-Furness.

Radio Notes.

Australia.—REDUCTION OF LICENCE FEES.—The *Melbourne Age* announces the reduction of the fees for broadcasting licences as from August 1st. The new rates, if paid for twelve months in advance, are stated to be 27s. 6d. for Zone 1, 25s. for Zone 2, and 22s. 6d. for Zone 3. It is also said that, if desired, the fees may be paid in two six-monthly instalments; in this case, states our contemporary, instalments will be 15s., 12s. 6d., and 10s. respectively. We think that we can guess which system will be favoured by listeners in Zone 3!

NEW STATION.—Most of the additional apparatus required for increasing the power of 3LO to its licensed power of 5 kilowatts has been completed at the factory of Amalgamated Wireless (Australasia), Ltd., in Sydney. The *Industrial Australian and Mining Standard* expects that the new high-powered apparatus will be installed at Braybrook and transmission resumed on full power about the middle of next month. When the wavelength of 3LO was reduced from 1,720 metres to 371 metres about two months ago, the modulation system was considerably altered to improve the signal strength and the quality of the modulation. The new station being erected by the Associated Radio Co. at Essendon is nearly completed, and it was hoped that the services from 3AR would be carried out from it this month. Apparatus for the transmitter is completed, and the aerial system at the station is erected. The power will be 1,600 watts, the present licensed power of the Melbourne station, but it is expected that signals from Essendon will be much louder than they were from the station in the city. In addition to the alterations at the station, extended alterations to the studio of 3AR are being carried out, and it is the intention of the Associated Radio Co. to apply to the Postmaster-General for a licence to use five kilowatts at the new station.

Austria.—NEW STATION.—It is reported from Berlin that the Telefunken Gesellschaft has secured the order for the construction of the new broadcasting station in Vienna, in competition against American and British tenders. According to the *Daily Mail*, before placing the order, the Austrian Government consulted an international college of 24 experts as to which system was the best in practice. The Vienna station is to be two and a-half times as powerful as the station just erected in Berlin.

Licences.—WARNING TO "PIRATES."—The Postmaster-General has issued a further warning to those who possess unlicensed receiving sets. He states that the short Act passed a few weeks ago places beyond doubt a legal obligation upon listeners to take out a licence. He intends to institute proceedings in any case of unlicensed reception which may come to his notice in the future.

Philippines.—RADIO DEVELOPMENT.—*The Telegraph* and *Telephone Age* states that radio has made tremendous strides in the Philippines during the past year, and has proved an ideal means of communication in this immense group of islands stretching 1,000 miles north and south and over 600 miles east and west. The Philippines legislature has granted a fifty-year concession to the Radio Corporation of America and the Far Eastern Radio, an affiliated company, and installations to cover the whole country are proceeding rapidly. The terms of the concession provide that within a year the radio company must have in operation a broadcasting station that will reach every part of the archipelago. The company is authorised to handle all ship-to-shore and shore-to-ship business as well as commercial wireless business to and from other countries.

United States.—RADIO ON THE FARM.—The American Department of Agriculture, basing its conclusions on a national survey, has just declared that to-day 550,000 American farms are equipped with radio receiving sets, compared with 365,000 a year ago, and 145,000 in 1923. The State of Illinois leads with 46,000 farm sets, and New York and Iowa each possesses 39,000. Delaware is at the bottom of the list with 200.—*Manchester Guardian.*

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—P.M.G.'s Department. November 17th. Magneto-automatic junction material.*

Dublin.—September 29th. Port and Docks Board. 28 pairs of tramway-type switches (chilled iron with manganese steel tongues). Specifications from the Engineer's Office, East Wall, Dublin.

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installation at Enfield House. (See this issue.)

Greenock. — September 29th. Corporation. Electric lighting of 104 houses. Schedules from Office of Public Works, Municipal Buildings.

India.—India Store Department. October 14th. L.p. turbine-driven d.c. generating set, condensing plant, and accessories. (September 18th.)

Leeds.—September 23rd. Board of Guardians. Electric lighting installation at the Institution, 3, Green Hill Road, Armley. Form of tender from Mr. J. H. Ford, clerk to Guardians, Poor Law Offices, South Parade.

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (See this issue.)

London.—LONDON COUNTY COUNCIL.—Highways Committee. October 12th. H.p. and l.p. switchgear for Shoreditch L.C.C. tramway sub-station. (September 18th.)

ISLINGTON.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (See this issue.)

H.M. OFFICE OF WORKS.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (See this issue.)

Manchester. — October 7th. Electricity Department. One 10-ton hand-operated overhead travelling crane and gantry. Specifications from Mr. H. C. Lamb, manager, Electricity Department.

New Zealand.—WELLINGTON.—Post and Telegraph Department. October 27th. Rubber-insulated wire.*

Public Works Department. November 24th. Neutral earthing reactors.*

December 8th. Steel transmission line supports for the Waikato power scheme.*

Portsmouth.—September 30th. Board of Guardians. Three months' supply of electrical fittings and lamps. Forms of tender from the Guardians' Offices, St. Michael's Road, Portsmouth.

Rochdale.—September 29th. Paving Committee. One 4-in. Stereophagus centrifugal sludge pump and motor. Motor to be direct coupled and pump to be fixed on cast-iron bedplate. Borough Engineer, Town Hall.

Rosslynlee.—September 26th. Midlothian and Peebles District Asylum. Stores, including electrical fittings, &c. Forms of tender from Mr. C. L. A. Smith, clerk, 19, Heriot Road, Edinburgh.

South Africa.—JOHANNESBURG.—S.A. Railways. October 29th. Electric cables and wires.*

CAPE TOWN.—October 14th. Electricity Department. Electric motors.*

Stoke-on-Trent.—October 12th. Electricity Supply Department. Two sets of steam air ejectors, and one centrifugal oil purifier. (See this issue.)

Workington.—October 3rd. Corporation. L.p. cables and services. (September 18th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Aylesbury.—Town Council. Accepted:—
400 yd. of cable (£174).—Enfield Cable Works, Ltd.
Service apparatus (£53).—General Electric Co., Ltd.

Blackburn.—Education Committee. Accepted:—
Installing electric light at the Four Lanes' End Council school.—Farquhar and Heys.

Burnley.—Board of Guardians. Accepted:—
Electrical goods.—Frank Thornton & Co.

Government Contracts.—The following Government contracts were placed during August, 1925:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Electric boxes.—Player & Mitchell.
Cells.—London Battery & Cable Co., Ltd.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Fuller's United Electric Works, Ltd.
Aerial coils.—Radio Instruments, Ltd.
Inductance coils.—H. W. Sullivan, Ltd.
Electric travelling crane.—Marshall, Fleming & Co., Ltd.
Heating elements.—Electric Heating Co., Ltd.
Magazine lamp fittings.—Oliver Pell Control, Ltd.
Electric incandescent lamps.—Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.; Siemens and English Electric Lamp Co., Ltd.; Metro-Vick Supplies, Ltd.
Switch and fuse panels.—General Electric Co., Ltd.; W. McGeoch & Co., Ltd.; Switchgear & Cowans, Ltd.
Platinum wire.—Johnson, Matthey & Co., Ltd.
Electrically-driven log band saw.—A. Ransome & Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Table fans and spares.—General Electric Co., Ltd.
Electric tractors.—British Electric Vehicles, Ltd.
Transformers.—Foster Engineering Co., Ltd.

WAR OFFICE.

Aluminium alloy and ingots.—British Aluminium Co., Ltd.
Cable drums and stands.—Ruston & Hornsby, Ltd.
Telephone cable.—W. T. Glover & Co., Ltd.
Negative and positive carbons.—General Electric Co., Ltd.
Watch receivers.—Phœnix Telephone & Electric Works, Ltd.

AIR MINISTRY.

Inert batteries.—Siemens Bros. & Co., Ltd.
200-V battery.—Alton Battery Co., Ltd.
Electric meters (Iraq).—Nalder Bros. & Thompson, Ltd.
Switchboard (Catterick).—Switchgear & Cowans, Ltd.
Wiring quarters (East Camp, Halton).—T. Clarke & Co., Ltd.
Electric shock absorber cord.—Whiteby Exerciser, Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.; Small Electric Motors, Ltd.
Hand-driven generators and spares.—Evershed & Vignoles, Ltd.
Magnetos.—British Thomson-Houston Co., Ltd.
Masts and spreaders.—McGruer-Hollow Spar Co., Ltd.
Receivers.—Gambrell Bros., Ltd.
Switch boxes.—General Electric Co., Ltd.

POST OFFICE.

Repairing batteries.—Stockport Telephone Exchange: Alton Battery Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Lee Green-Eltham and Wanstead-Woodford Junction: Johnson & Phillips, Ltd. Primrose Hill-North, Sloane-Paddington and City East: Callender's Cable and Construction Co., Ltd. Holborn-City-Central Junction and Holborn-Royal Junction, Museum-Victoria Junction: W. T. Henley's Telegraph Works Co., Ltd. Marlborough-Wroughton (Wilts) and Hull-Bridlington: Western Electric Co., Ltd. Nottingham-Basford-Kimberley: B. I. & Helsby Cables, Ltd.
Conveyors (Glasgow H.P.O.).—H. Simon, Ltd.
Private branch exchange equipment.—Simons & Co., Ltd. (Glasgow); Appleyards (Leeds), Ltd.; Price's Patent Candle Co., Ltd. (Battersea); Barrow, Hepburn & Gale, Ltd. (S.E.1): Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Harrow, Eltham, Finchley, Mill Hill: Automatic Telephone Manufacturing Co., Ltd.
Telephone repeater station repeater equipment.—Gloucester and Newport (Mon.): General Electric Co., Ltd.
Testing and protective apparatus.—Chamberlain & Hookham, Ltd.; Telephone Manufacturing Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; Cable Accessories Co., Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Manufacturing Co., Ltd.; T. Watson; Western Electric Co., Ltd.
Wireless apparatus.—General Electric Co., Ltd.
Battery stores.—Chloride Electrical Storage Co., Ltd.
Cables (various).—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Cords for telephones.—British Insulated & Helsby Cables, Ltd.
Electric hand lamps.—Cable Accessories Co., Ltd.
Earth plates.—Bullers, Ltd.
Distribution cable plugs.—Siemens Bros. & Co., Ltd.
Electric battery trucks.—W. Goodyear & Sons, Ltd.
Bronze wire.—Johnson & Phillips, Ltd.
Enamelled copper wire.—Concordia Electric Wire Co., Ltd.
H.d. copper wire.—Nevill, Druce & Co., Ltd.
Lamps.—A. C. Cossor, Ltd.

H.M. OFFICE OF WORKS.

Ministry of Pensions, Bristol.—Electric lift: W. Wadsworth.
Wiring, Imperial College of Science.—H. J. Cash & Co., Ltd.
Battery, National Physical Laboratory, Teddington.—D.P. Battery Co., Ltd.
Wiring Victoria and Albert Museum, S.W.: T. Clarke & Co., Ltd.
Watford Research Station, laying cables, wiring, &c.—T. Clarke & Co., Ltd.
Erection of plant.—G. Hopkins & Sons (Clerkenwell), Ltd.

CROWN AGENTS FOR THE COLONIES.

Underground cables, &c.—W. T. Henley's Telegraph Works Co., Ltd.
Overhead electric travelling crane.—Vaughan Crane Co., Ltd.
Electric materials.—St. Helens Cable & Rubber Co., Ltd.
Electric pneumatic hammer.—B. & S. Massey, Ltd.
Insulators.—Doulton & Co., Ltd.
Electricity meters.—Ferranti, Ltd.
Rotary converters.—Mather & Platt, Ltd.
Telegraph ironwork.—Bullers, Ltd.
Telegraph instruments.—Walter's Electrical Manufacturing Co., Ltd.
Automatic telephone apparatus.—Relay Automatic Telephone Co., Ltd.; Siemens Bros. & Co., Ltd.
Static transformers.—Brush Electrical Engineering Co., Ltd.; English Electric Co., Ltd.
Copper wire, &c.—Richard Johnson, Clapham & Morris, Ltd.; Elliott's Metal Co., Ltd.
Bronze and copper wire, &c.—Shropshire Iron Co., Ltd.
Wiring materials.—Callender's Cable & Construction Co., Ltd.

METROPOLITAN POLICE.

Electrification of lift, New Scotland Yard.—Express Lift Co., Ltd.

Grimsby.—Electricity Committee. Accepted:—
Battery, booster, and switchgear (£7,037).—Tudor Accumulator Co., Ltd.
Spare transformer (£275).—Hackbridge Electric Construction Co., Ltd.

Irish Free State.—DUBLIN.—Commissioner of Public Works.
Electric lighting, McKee Barracks.—Haden's Engineering Co., Ltd.

The following contracts were placed by the Controller of Stores, Department of Posts and Telegraphs, during August, 1925:—
Dry batteries.—Ever-Ready Co. (Gt. Britain), Ltd.
Dry cells for batteries.—Tyer & Co.
Cable.—British Insulated & Helsby Cables, Ltd.
Ducts.—Standard Brick Co.; Oates & Green, Ltd.
Fuses.—Phœnix Telephone & Electric Works, Ltd.
Insulators.—W. J. Kellie.
Insulator rings.—MacIntosh & Co.
Switchboards.—Western Electric Co., Ltd.
Wire.—British Insulated & Helsby Cables, Ltd.
Creosoted wood troughing.—Eustace & Co.
—*Irish Builder and Engineer.*

Kettering.—Electricity Committee. Accepted:—
Cooling tower and tank (£2,800).—Davenport Engineering Co., Ltd.
Circulating-water pipes (£1,250).—Brightside Foundry & Engineering Co., Ltd.

Lamp Contracts.—The Stores Department, General Post Office, has placed contracts for 12 months' supplies of electric lamps with Edison Swan Electric Co., Ltd., Metro-Vick Supplies, Ltd., and Siemens & English Electric Lamp Co., Ltd.

London. — ISLINGTON. — Electricity Committee. Recommended:—
50-ton electric crane (£8,155).—Babcock & Wilcox, Ltd.

ST. PANCRAS.—Electricity and Public Lighting Committee.
One 10,000-kW turbine, with alternator, condensing plant, steam and water circulating pipes, &c.

Fifteen complete tenders and six tenders quoting for the condensing plant only were received. Five tenders were from foreign firms, and the Committee, being of opinion that the Council would desire the set to be of British manufacture, has given consideration to the offers made by British firms, and recommends the acceptance of the tender of the Brush Electrical Engineering Co., Ltd., at £40,660.

Oswaldtwistle.—
Electrical installation at Holy Trinity Church.—Mr. W. Kirkham.

Southend-on-Sea.—Town Council. Accepted:—
Spares for Diesel engines:—
12 exhaust valve boxes (£420), three inlet valve boxes (£96), and one set of intercoolers (£135).—Belliss & Morcom, Ltd.
One cylinder head cover (£140).—Thompson, Watts & Co., Ltd.

Stoke.—Stoke and Wolstanton Board of Guardians. Accepted:—
Electrically-driven pumping plant (£775).—Couzens & Akers, Ltd.

Swansea.—Electricity Committee. Accepted:—
Grit catcher at sub-station (£430).—Tipton Tub and Tube Co.

Yarmouth.—Electricity Committee. Accepted:—
Cable (£8,936).—British Insulated & Helsby Cables, Ltd.
3,000-kW turbo-generator (£21,220).—Brush Electrical Engineering Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, September 25th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "The Theory and Application of the Thermionic Valve," by Mr. G. C. Marris.

Faraday Society.—Thursday and Friday, October 1st and 2nd. At Jesus College, Oxford. Discussion on "Photochemical Reactions in Liquids and Gases."

Junior Institution of Engineers.—Friday, October 2nd. At 39, Victoria Street, S.W. Lecturette, "Problems of Broadcasting," by Mr. H. Bishop.

Electrical Power Engineers' Association.—October 2nd. Lecture by Mr. J. T. Ruddock, "Notes on Boiler and Chain-grate Operation." At the Institution of Electrical Engineers, Victoria Embankment, W.C.2.

Smoke Abatement Conference.—Friday, October 2nd, to Monday, October 5th. At Buxton.

Notes.

Electric Iron Test.—We learn that at one of the hotels at Ullapool, Ross, a laundry-maid by mistake left a "Magnet" electric iron switched on at about 8 o'clock at night and it was still on at 9 a.m. next morning. The iron had burned through a two-inch deal table and dropped right through and was hanging by the flexible cord in the morning. On examination the elements of the iron were found to be in good condition.

Fatality.—In the London City Coroner's Court, on Monday last, Dr. F. J. Waldo, the City Coroner, held an inquest with reference to the death of Valentine George Sinden, aged 36 years, fireman sub-officer at East Greenwich station, who was killed when a fire broke out on Friday last at 2, Byron House, Finsbury Street, E.C., premises occupied by Mr. Max Kracke, a toy and fancy goods dealer. It was stated that the deceased man was playing water on the fire when his helmet came in contact with an electric wire, and he fell back groaning, and was taken unconscious to St. Bartholomew's Hospital, where he died shortly afterwards.

Station-Officer Stonestreet, attached to the Redcross Street station, was asked by the Coroner: "Do you take special precautions when you are aware that there are live wires about?"

Witness: No, sir, we accept the risk, especially if the wires are only for lighting purposes.

Giving further evidence, he said that the metal part of Sinden's helmet came into contact with a tube containing a live wire.

Mr. Martin, house physician at St. Bartholomew's Hospital, said that artificial respiration was tried for an hour and a half, and injections were made, but without result.

Sir Bernard Spilsbury gave evidence that he could find no natural cause of death, and he had come to the conclusion that death was due to electric shock. The witness was asked by Mr. Pawlyn, who appeared to represent the L.C.C., if he had ever known a voltage of 210 volts to kill a man, even if his clothes were wet. In reply, Sir Bernard said that such cases were, of course, very rare, but there had been fatal cases from even a lower voltage. He was of opinion that if the current were transmitted through a man's head the risk would be materially increased.

Mr. Pawlyn: I am told that nearly every man in the Fire Brigade from time to time receives shocks from electric wires, and this is the first time we have heard of one having fatal results.

At the request of the Coroner, the jury then viewed the premises, and on their return Mr. Roberts, electrical engineer to the City Corporation, said that, so far as he had seen, and from what he had heard from the witnesses, he did not think the fire was caused by electricity. In this building slip tubing was used, but the Institution of Electrical Engineers had now agreed that only screwed tubing should be used. The man must have been standing in some water, which would have intensified the shock.

In summing up, the Coroner said that the L.C.C. should take precautions in future against firemen using helmets that could conduct electricity, as he knew that some firemen used leather helmets, which were safe.

The jury returned a verdict of "Accidental death caused by electric shock," and added that, in their opinion, electrical installations should be brought up to date, and steps taken to prevent further accidents.

The Second World Power Conference and Executive Committee Meetings.—A meeting of the International Executive Committee was held in London on July 27th-30th. Twenty countries were represented and the representatives welcomed Mr. O. C. Merrill, Executive Chairman of the American National Committee, who crossed the Atlantic for the express purpose of being present. Plenary meetings of the International Executive Committee and meetings of Sub-Committees were held throughout the period July 27th-30th. After the chairman, Mr. D. N. Dunlop, had made a formal report regarding the publication of the Transactions of the First World Power Conference, and other matters arising out of the first Conference, various questions relating to the future activities of the movement were discussed.

An invitation was presented on behalf of the Swiss National Committee by Dr. E. Tissot, to hold the Second World Power Conference at Basle in 1926, on the occasion of the International Exhibition for Inland Navigation and Utilisation of Hydraulic Power. It was, however, the unanimous opinion of those present that a longer period than one or two years was necessary between each plenary session of the World Power Conference, and that probably 4-6 years was the proper interval. But with a view to keeping interest alive between plenary conferences and to securing general progress in the fulfilment of the objects of the World Power Conference, it was decided to hold sectional meetings under the auspices of the International Executive Committee. These sectional meetings, which should originate on the initiative of individual National Committees, may be held in different geographical areas to discuss a programme of specific subjects within the general conference programme, and general invitations to participate will be extended through the central office in London to all the National Committees and representatives. An invitation was accordingly transmitted to the Swiss National Committee to hold a sectional meeting at Basle in 1926. The International Executive Committee recommended that this meeting should deal with the following subjects:—The development of hydro-electric power combined with inland navigation; the inter-exchange of electric power between countries, to be studied particularly from the financial and legal points of view;

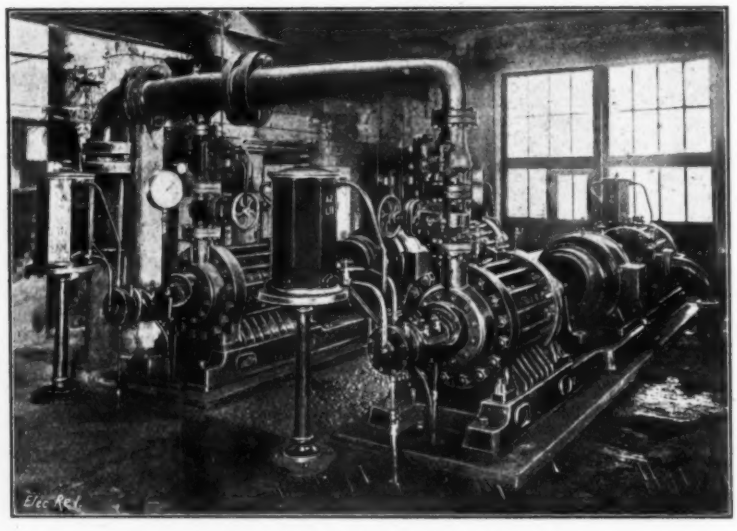
the economic relation between hydro and thermal power; electricity in agriculture; and railway electrification.

It was further recommended that the programme of the sectional meetings at Basle should lay stress upon the financial and economic aspects of these subjects. The question of a properly constituted international form of organisation was considered by a sub-committee appointed for that purpose. It drafted a constitution which was approved by the International Executive Committee and will be submitted to the National Committees for consideration, and if possible will be finally approved with whatever amendments are suggested at the next meeting of the Committee which it is proposed should be held at the time of the Basle sectional meeting in 1926.

To facilitate the carrying out of the objects of the World Power Conference and to maintain contact between the various National Committees and representatives of the participating countries, the International Executive Committee recommended that a "Journal of the World Power Conference" should be published at fairly regular intervals under its auspices. It envisaged that this journal would contain articles, statistical information, reports and data regarding progress in matters coming within the objects of the World Power Conference, and the committee placed it on record that the journal, as the official organ of the World Power Conference and the medium for the exchange of information between the constituent National Committees, should not conflict with nor overlap the functions of existing technical publications or journals published by scientific and technical institutions.

It was decided, subject to reconsideration, that the Second World Power Conference should be held in 1930, and on the invitation of the Italian Government that it should be held in Rome if conditions at that time were comparable to those at present existing.

Electrical Plant at the Southampton Docks.—In our last issue we published an abstract of a paper upon the above subject, which was read by the Dock Electrical Engineer (Mr H. Wauchope) before the Engineering Section of the British Association. In this abstract mention was made of the pumping plant supplied by Messrs. Mather & Platt, Ltd.; we have now received a photograph of some of this plant, and it is reproduced herewith. The equipment illustrated comprises two 17-stage turbine pumps which are installed in the No. 3 pumping station to provide the necessary hydraulic power for the pumps used for de-watering Nos. 1, 2 and 3 dry docks. Each pump is designed to deliver 200 gal. of sea water per minute against a pressure of 750 lb. per sq. in. The pumps are driven by 3-phase slip-ring induction motors rated at 165 b.h.p., and running at 1,450 r.p.m., with supply at 415 V. The starting and stopping of the pumps is automatically controlled by tappets on the hydraulic accumulator.



Mather & Platt Pumping Plant at Southampton.

Lecture.—Mr. Harry Moss is to deliver a lecture on "Modern Developments in Electric Lighting for Industrial Purposes" before the Bradford Engineering Society at the Technical College, Bradford, on October 12th.

Association of Special Libraries and Information Bureaux.—A conference is to be held at Balliol College, Oxford, during the week-end September 25th-28th, under the auspices of the above Association. The subjects to be considered include the present position of the Special Library movement; informational work in the spheres of politics, business, science, engineering, transport, medicine, and patents; public and university libraries, and so forth. Amongst those intending to be present are representatives of Government departments, learned societies, research associations, the technical and general Press, public libraries, the leading electrical manufacturing companies, &c. Papers are to be read on "Decimal Classification" (Prof. A. F. C. Pollard), the "Co-ordination of Technical Intelligence" (Major W. E. Simnett), "Efficient Filing" (Mr. R. Borlase Matthews), "Research as the Basis of Advertising" (Mr. S. Wood), "Patents and Special Libraries" (Mr. H. E. Potts), and many other subjects. The address of the organising secretary is 38, Bloomsbury Square, London, W.C.1.

Collisions on the Southern Railway.—Reporting on three buffer-stop collisions which occurred at Guildford station on the Southern Railway in July last, Major G. L. Hall states that they were not due to any defect in the brake equipment, but to lack of experience in the working of the Westinghouse brake. The collisions were of a minor character, and of the type which would be eliminated by further experience.

Appointments Vacant.—Shift engineer, for the Borough of Southport electricity department; clerk (50s.), for the Basingstoke Corporation electricity department; showroom attendant (£250), for the Borough of Mansfield electricity department.

Nottingham Electricity Supply.—Last week one or two minor disturbances took place in the supply of electricity to Nottingham, and on Saturday evening the supply was cut off for some time. The mishap had no relation to the operation of the plant in the new power station at North Wilford, which has run quite satisfactorily from the commencement; we understand that it was due primarily to a faulty connection on the switchgear at the Talbot Street station, which is being converted into a sub-station receiving a 3-phase supply at 11,000 volts from North Wilford. The low-pressure three-wire system was also temporarily disorganised on Saturday in the central area.

North Swedish Copper Deposits.—In connection with the recent Swedish discoveries of copper and pyrites ore, prospecting has been going on since 1920. Loose lumps of copper pyrites have been found for 20 years or more in the district, which has led to the registration of claims on different occasions. The mother lode was discovered in 1920, and proved to be the centre of a new ore field extending some 40 miles east and west, being about 6 miles broad. Investigations carried on by the Geological Survey and the Centralemissions concern led to the discovery of important lodes, but the work is by no means concluded. In parts, *e.g.*, at Bjurfors (owned by the Government) there is pure copper ore, but for the rest the copper and sulphur pyrites ores alternate, or are mixed together, containing in places gold, silver, and arsenic in economically workable quantities. The Government and Centralemission Banking Syndicate own the ground and claims in practically the whole district, although there appear to be some outsiders owning stray claims. The prospecting has cost the bank about a million kroner and it has been made possible by the Lundberg electrical ore detection method. The practical value of the method is said to have been proved. Nearly the entire district is covered by a layer of earth, in general about 60 ft. thick, the rock being but rarely seen and the cost of removing such great masses of earth would have been almost prohibitive, but when the probable extent of the ore bodies had been determined by the electrical method, it was comparatively easy to carry out the necessary deep drilling. The ore is present at the very surface of the rock, underneath the layer of earth, and all that will be required before starting operations is to remove the earth. The deposit to be worked immediately was not discovered until about six months ago; it lies within reach of a sea port, the distance to Skelleftea being about 18 miles. The pyrites here contains some 5 or 7 per cent. of copper. The larger deposits, however, depend for their operation on the construction of a railway branch line. Negotiations are now being conducted for leasing both the bank's and the Government's deposits to a mining company, which is to commence operations after a railway has been built. The deposits already located should be sufficient to cover the present Swedish importation of copper and pyrites. This is one of the most important ore finds in Europe in recent years.—*Swedish Export.*

Birmingham Electric Club.—The first event of the half-session is the delivery to-night, Friday, of a lecture on "The Theory and Application of the Thermionic Valve," by Mr. G. Chris Marris. Subsequent events in the programme are:—October 16th, "Power Factor Improvement as Affecting the Economical Running of Works Plant," by Mr. F. C. Hall; November 13th, "Submarine Cable Manufacture and Laying," by Mr. H. Gurney Wood. All of the foregoing will be illustrated by lantern slides and the meetings will be held at the Grand Hotel, Colmore Row, Birmingham, at 7 p.m.

Midland Electrical Engineers' Ball.—It has been decided to hold the Midland Electrical Engineers' Ball this season at the Grosvenor Suite, Grand Hotel, Birmingham, on Friday, November 20th. Mr. R. A. Chattock is the president, and Mr. W. H. Heaton the chairman, and Messrs. N. A. Collard, Daimler House, Paradise Street, Birmingham, and W. Y. Anderson, 14, Dale End, Birmingham, are acting as joint honorary secretaries. Tickets are one guinea each, and may be obtained from any of the above-mentioned gentlemen.

Alleged Practical Joke Fatality.—On September 18th, an inquest was held into the death of Charles Angus, Glasgow, who received a fatal electric shock as the result of an alleged practical joke. Deceased was employed in the Tollcross works of Brown & Macfarlane, iron and steel merchants, and on August 25th he met his death by touching the handle of a door to which a "live" wire had been attached. The manager of the works said the current passing had a pressure of 250 V. A formal verdict was returned by the jury. A 17-years' old boy named Gray is in custody in connection with the tragedy.

Liverpool Electro-Harmonic Society.—This Society enters upon the second year of its existence on October 23rd. The increase in membership has enabled the Society to transfer its meetings to the Bear's Paw in the Rotary Room, but in order to secure further success a very much larger membership is necessary and gentlemen connected with the electrical trade in the district are urged to get into touch with the secretary, Mr. E. Y. Wilkinson, c/o The British Thomson-Houston Co., Ltd., 14, South Castle Street, Liverpool, with a view to joining. The Society holds monthly meetings—on the fourth Friday in the month, excepting in December, when the third Friday is the appointed day. The first concert takes place on October 23rd. Old friends have been engaged, including the Zingara Quartet, Mr. Ben Woods, comedian, and Mr. Wm. Cross, pianist. The subscription is 10s. 6d. per annum.

Works Visits.—On September 10th a party of members of the Iron and Steel Institute paid a visit to the Witton Works of the General Electric Co., Ltd. The company entertained the party at luncheon; Dr. Railing occupied the chair, supported by the president of the Institute, Sir Frederick Mills, and Sir Robert Hadfield.

On September 16th members of the Manchester Association of Engineers visited the works of the British Insulated and Helsby Cables, Ltd., Prescot. During the tea which followed the tour of the works, the president, Mr. R. Onions, expressed the thanks of the visitors, and Col. Bates, the works manager, briefly responded.

Wood Separators for Accumulators.—Some experiments with regard to the electrical resistance and mechanical strength of storage-battery separators have recently been carried out by the United States Bureau of Standards. The life and internal resistance of accumulators depend largely upon certain properties of the separators, which are usually made of wood. In the tests the electrical resistance of the separators was measured by placing a specimen in an electric circuit consisting of two branches supplied by a transformer having two secondary windings. The current from one of the secondary windings was passed through a known area of the separator to be measured. The current from the other winding was passed through a slide wire and resistance box which served as a potentiometer. The accuracy of the method was within 1 per cent., which was sufficient for the purpose, since the resistance of the different samples of the same kind varied by as much as 15 per cent. The results of the measurements of the resistance and mechanical strength show the effects produced by the different conditions to which the samples were subjected. The results, in general, were as follows:—Electrical Resistance.—(*a*) The resistance was found to change for some time after immersion, but became practically constant after two or three weeks. (*b*) The resistance was proportional to the resistivity of the acid in which the sample was immersed. (*c*) The resistance of the separators treated by the caustic-soda method was lower than for like samples treated by the steam method. (*d*) The temperature coefficient of resistance was approximately the same as the coefficient of resistivity for sulphuric acid solutions of the same density. (*e*) The resistance of samples of different thicknesses, but identical in other respects, was approximately proportional to their thickness. (*f*) The resistance of the sawn separators was smaller in most cases than that of the rotary cut samples. Mechanical Strength.—(*a*) Immersion in acid solutions was found to weaken the wood fibres. The strength decreased with time of immersion and concentration of the solution. When the specific gravity exceeded 1,300 the action was severe. (*b*) The strength decreased with increase of temperature of the acid solution. (*c*) The strength was approximately proportional to the thickness of the samples.

Street Lighting.—Mr. R. F. Brown, a surveyor of Clacton-on-Sea, has invented and patented a method of illuminating electrically the white lines used at dangerous street corners. The Ministry of Transport has expressed appreciation of the idea, and is having an experiment made at Whitehall, while the practicability of the invention is also to be tested at Brighton and Clacton. Mr. Brown's novel idea consists of the use of channelling carrying a line of white marble with a strip of thick plate glass down the centre, electric lamps being placed at intervals below the glass.

Electricity Supply Association of Ireland.—THE SHANNON SCHEME.—At the annual meeting in Dublin of the Electricity Supply Association of Ireland, the report, which was adopted, stated that the Association was not in agreement with the Shannon scheme as formulated and directed by the Government, regarding it as objectionable and not in the best interests of the country, to allocate a contract to any firm without the usual open competition. The Council had come to the conclusion that the scheme would entail an expenditure that would not be warranted by the condition of the country, or by the possible demand for power, and it was of opinion that the better course would have been to retain independent expert consultants of repute in the first instance to survey the main sources of power and to investigate the probable demand. On the report of these consultants would be based the programme for the future. If the State then decided to embark on national power supply, the contracts for the works decided upon would be allocated by public tender, on the basis of specification prepared by the independent consultants.

The country was now definitely committed to State electricity supply from the Shannon, and the Association was prepared to co-operate fully in the work of getting the best possible results out of the scheme adopted, whilst at the same time assisting to safeguard the interests of its members.

Boiler Litigation in the United States.—In the United States District Court of New York recently the Babcock and Wilcox Co. alleged the infringement of its patents by the Springfield Boiler Co. and the Superheater Co. The judge held that while the boiler in question (which was installed in the Hell Gate station of the United Electric Light and Power Co., New York) was of a construction which might bring it within the reading of the claims of the Pratt patent and, if a liberal interpretation was given, of the Bell patent, the question whether such readings should be made necessitated reference to the development of the boiler art of the present day. According to the *Electrical World*, in delivering his decision, the judge said:—"The net result of my examination of the facts in this case is that defendants have constructed a type of superheater water-tube boiler that differs materially from that shown and claimed by the patents in suit, and that it is accomplishing results which, if they were contemplated by Pratt and Bell, are brought about by a construction that avoids any valid claim of infringement of the patents granted upon their inventions. It follows that the claim must be dismissed." An appeal may be entered by the plaintiffs.

The Passing of the Ampere.

I am the cunning Ampere, swift as light
I speed along my copper bands and fling,
Burning, my vital force to move great deeds.
Great is my master Volta, it is he who moves
On our swift path my brethren and myself,
Braving the hostile Ohms who stay our flight
In vain; mocking and burning them awhile
To the full square of our numbers; anon,
The children of our sojourn, born methinks
In fields of force, now linking hand with us,
Cast wide their potency and urge to life
Amperes new-born along some other line.
Seductive Millihenries hail—we stay,
Lagging behind our master; and to haste
Errant these footsteps, summon to our aid
Fierce Microfarads from their house of power,
Quickening our laggard feet. Now race ahead,
Speed on my brethren—death to yonder fuse!
Burst we these copper bands, vanquish in fire
Delicate instruments sapping our strength!
Now glow these copper fiends, they cannot hold
Aught of our mightiness; on, brethren, on!
Smoke rises round us . . . they fail! we triumph!
(*Crash! The breakers come out.*)

. . . . . .

Brethren, I'm failing; fast wanes my power.
Volta is dead, and life's cord is broken.
I'm waning and dying—dying—dying—
The circuit's at an end. . . .

—A. G. H. DENT.

An Electric Refractory Furnace.—There has been erected at Gustafsberg, near Stockholm, an electric tunnel kiln for use in the firing of teacups. It is 6 ft. long by 2 ft. wide and into it is placed a truck about 2 ft. wide and 2 ft. long with a capacity of 3,000 cups. It is stated that the cost of energy is two or three times less than would be the case if a directly-fired coal kiln were used for the purpose. Moreover, the control of the heat, and the temperature obtained are such that the ware is in the heat zone only a quarter to half the time necessary with a coal-fired kiln, whilst the temperature is only limited by the risk of cracking the pottery as it goes through the hot zone. Some interesting features are claimed in the design of the electrical control arrangements.

An Abortive Electricity Commission.—Some time ago the Government of New South Wales appointed a State Commission to inquire into the question of the supply of electricity in Sydney and its surrounding districts, as well as the whole of the State. Last month, however, the Premier (Mr. Lang) announced that the Commission had not functioned and the appointments had not been gazetted. The Commission had therefore been allowed to lapse.

Institution Notes.

Institute of Metals.—The programme for the session 1925-26, which begins in October, shows that six lectures on metallurgical subjects are to be given during the winter months before each of the Institute's six local sections. The programme also includes particulars of the meetings of the parent Institute in London; one of these is the 1926 May lecture, to be given by Professor H. C. H. Carpenter, F.R.S., on "Single Metallic Crystals and their Properties." A copy of the programme can be obtained from the Secretary of the Institute, 36-38, Victoria Street, S.W.1.

Institute of Transport.—The programme of meetings includes the following:—

Friday, September 25th.—North-Western Local Section, at Midland Hotel, Manchester. Discussion, "Underground Railways for Manchester."

Monday, October 5th.—Ordinary meeting at Institution of Electrical Engineers, London. Presidential address by Col. Sir Joseph Nall, D.S.O., T.D., M.P. Yorkshire Local Section at Town Hall, Leeds. Chairman's address, "Canals," by Sir John Eaglesome, K.C.M.G.

Saturday, October 10th.—North-Eastern Local Section, at Town Hall, Newcastle-on-Tyne. Paper, "Electric and Petrol Transport of Passengers in America," by Walter Jackson.

Friday, October 16th.—North-Western Local Section, at Midland Hotel, Manchester. Paper, "Electrically-propelled Vehicles for Road Transport," by F. Ayton.

Tuesday, October 20th.—Lecture for Graduates and Students at Institution of Electrical Engineers, London. "Electric and Petrol Transport of Passengers in America," by Walter Jackson.

At the meeting on October 5th, Sir Lynden Macassey will present the premium awards in respect of the 1924-25 Session.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

At the meeting of the Hackney Borough Council on Wednesday of last week, Mr. ALFRED CHARLES BOSTEL, sales engineer to the Croydon Electricity Supply Department, was appointed to the position of sales manager in the Borough Electricity Department. Of the twenty-eight applicants, three were asked to appear before the Council for the purpose of final selection. Before the applicants were introduced in the Council Chamber, Alderman Morrison asked that the Council be informed as to the number of marks gained by each candidate at the examination. Councillor Langton said that the disclosure was not desirable, also that an examination was not the only criterion of the right man, there were other qualifications to be considered. Alderman Morrison said he was not going to vote for a man on his appearance, he had a public duty to perform, there must have been an order of merit and he moved that the Council go into committee to consider the matter; he was of the opinion that there was something "going on." The motion was lost and the choice made as stated above. Alderman Morrison did not vote.

At a recent meeting of the Walsall Town Council, a recommendation of the Electric Supply Committee to increase the salary of the manager of the undertaking (Mr. H. A. HOWIE) from £810 to £900 per annum was carried.

M. ALEXIS E. DUVAUX, general director of the Compagnie Générale d'Electricité, of Paris, has been recently appointed a Chevalier of the Légion d'Honneur.

Lieut.-Col. F. V. WILLEY, the president of the Federation of British Industries, sailed in the *Aquitania* last week for New York. He is to stay in the United States for a month, thereafter visiting Canada.

Mr. L. MARSHALL JOCKEL has been appointed station superintendent, not boiler-house superintendent, at North Wilford power station, as stated in the ELECTRICAL REVIEW for September 18th, p. 468. Mr. D. H. Brown, A.M.I.E.E., is the boiler-house superintendent.

Mr. W. A. SYCAMORE, who recently resigned his position as London manager of the Keighley Gas and Oil Engine Co., has joined Vickers-Petters, Ltd., and will be attached to their London office, 75b, Queen Victoria Street, E.C.4.

Mr. T. T. D. GEESIN, who was appointed general manager of Messrs. Walter Gee & Son, Ltd., engineers, Paisley, in February last, has now been appointed to a seat on the board of directors.

Mr. S. E. POVEY, formerly resident engineer at the Formby power station of the L.M.S. Railway Co., is shortly leaving this country to take up a position at Bombay.

Mr. PERCY H. NAFTEL, A.M.I.E.E., who has just retired from the position of installation engineer of the Liverpool Corporation Electric Supply Department, entertained his staff to a complimentary dinner at which he was presented with a silver cigar casket. His successor is Mr. SAMUEL LOWEY, who commenced his employment with the department in November, 1900.

Mr. S. HANN, borough electrical engineer, Stoke Newington, has been in poor health for some time past. The Electricity Committee reports that it has granted him four months' leave of absence, dating from July 13th, as recommended by his medical adviser.

Mr. A. H. POTT, consulting engineer, is removing on September 28th from Bishopsgate to 150, Dashwood House, Old Broad Street, E.C.2. 'Phone No.: "London Wall 4310."

According to Sydney newspapers just to hand it is likely that Mr. FORBES MACKAY, the general manager of the Sydney City Council's electricity department, will leave for London shortly in connection with arrangements for the purchase of the equipment for the new power station. The Sydney *Sun* hints at the possibility of his being retained in London as the Council's representative, heavy consulting and inspecting fees being saved in consequence. Whether Mr. Mackay will stay here for one or for two years is not clear, but it is remarked that while he is away from Sydney the power house will be built by the Council's engineers in consultation with Mr. H. E. White, a well-known city architect and engineer.

Mr. J. H. RIDER, whose portrait is reproduced herewith, was born at Bristol in 1864, and served his engineering apprenticeship with the firm of Paterson & Cooper, of Dalston; in 1887 he became electrical engineer to another well-known pioneering firm—Blakey, Emmott & Co., Ltd., of Halifax—but six years later he turned his attention to the supply side of the industry, being appointed borough electrical engineer by the Bolton Corporation. From 1896 to 1901 Mr. Rider occupied a similar position at Plymouth, where he designed and built a new power station. His next appointment was that of electrical engineer to the London County Council Tramways, which position he retained until 1910, when he went to South Africa as consulting electrical and mechanical engineer to the Central Mining & Investment Corporation, Ltd., of Johannesburg. In 1915 he returned to this country and became a partner in the firm of Preece, Cardew & Rider, consulting engineers, London. Mr. Rider is a member of the Institutions of Civil Engineers and Mechanical Engineers, and a past vice-president of the Institution of Electrical Engineers; he is also a past-president of the South African Institute of Electrical Engineers, and of the Incorporated Municipal Electrical Association. In 1909 he read a paper on "The Electrical System of the L.C.C. Tramways," for which he was awarded the Willans premium and the Institution premium of the I.E.E.; and in 1915 for his I.E.E. paper on "The Power Supply of the Central Mining—Rand Mines Group," he was awarded the Ayrton premium. In the course of his long professional career he has advised 36 municipal corporations and companies on questions relating to electricity supply, and he is well known as an expert engineering witness before Parliamentary Committees, at local inquiries, &c. One of his most recent achievements was the design and construction of the super-power station of the Nottingham Corporation at North Wilford, a description of which is concluded in this issue.

Photo by] [Army & Navy C.S.L. Studios.

Mr. J. H. Rider, M.Inst.C.E., M.I.E.E.,
Consulting Electrical Engineer.

Obituary.—HERR C. SCHWENNICKE.—The death is reported from Berlin of Herr Carl Schwennicke, who was with the Siemens & Halske Co. for 50 years. The deceased, who was 86 years of age and was well-known in connection with telegraphy, electrical signalling, and electrical measurement, was a co-worker with the late Werner Siemens.

MR. A. W. GATTIE.—We regret to record the death at the age of 69 years of Mr. Alfred Warwick Gattie, the inventor of the railway clearing house traffic scheme for London which was publicly discussed several years ago and was reported adversely upon by a Departmental Committee.

MR. G. MCCLUSKEY.—The death occurred on September 16th of Mr. George McCluskey, for many years outside electrical engineering manager to Messrs. J. H. Holmes & Co., Newcastle.

New Companies Registered.

Koda (London), Ltd. (208,414).—Private company. Registered September 15th. Capital, £25,500 in 25,000 3 per cent. cumulative preference shares of £1 and 10,000 ordinary shares of 1s. Objects: To adopt an agreement with G. Weissman to acquire and sell under patents Nos. 14,797, of 1922, 4,813, of 1923, and 463, of 1924, electric cell and battery and other electrical appliances and accessories in Great Britain and Ireland. The provisional directors are:—P. Shepherd, 22, Wellesley Road, Croydon, secretary; C. N. Blackburn, 43, Guildford Avenue, Surbiton Hill, chartered accountant. Qualification, £1. Solicitors: Windeor & Brown, 228, Bishopsgate, E.C.2.

Vaprost, Ltd. (208,428).—Private company. Registered September 16th. Capital, £5,500 in 3,000 10 per cent. cumulative preference and 2,000 ordinary shares of £1 and 10,000 founders' shares of 1s. each. Objects: To carry on the business of manufacturers and letters out on hire of and dealers in generators or any apparatus for the manufacture, generation or supply of gas, electricity, cooking apparatus and accessories, &c. The subscribers (each with one preference share) are:—E. G. Scott, 33/4, Broad Street Avenue, E.C.2, solicitor; L. C. Crick, 33/4, Broad Street Avenue, E.C.2, articled clerk. The first directors are to be appointed by the subscribers. Qualification, £100 shares. Remuneration, £100 each per annum (chairman, £50 extra). Solicitor: E. G. Scott, 33/4, Broad Street Avenue, E.C.2.

Blackadda Radio Co., Ltd. (208,465).—Private company. Registered September 18th. Capital, £3,000 in £1 shares. Objects:—To acquire the invention and letters patent No. 185,180 of 1921 for improvements in standardised and interchangeable component parts for construction of wireless apparatus, &c. The subscribers (each with one share) are:—C. A. Newton, Park Lane House, Littleover, Derby, electrical engineer; F. Newton, Weston Bank, Rodbourne Street, Derby, engineer. C. A. Newton is the first managing director and chairman. Qualification, 100 shares. Remuneration as fixed by the company. Secretary: F. Bond. Solicitors: Robotham and Co., 3, St. Mary's Gate, Derby.

Beaver Accumulator Co., Ltd. (208,463).—Private company. Registered September 18th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of, agents for, and dealers in accumulators, electric batteries and parts and accessories therefor, wireless instruments, &c. The directors are:—C. Manning, 80, Wigmore Street, W.1; J. K. Nethercoate, "Umgeni," Wimborne Road, Bournemouth; G. Laird, 180, Lauderdale Mansions, Maida Vale, W.1. Qualification, 1 share. Solicitors: Horner & Horner, Fitzalan House, Arundel Street, W.C.2.

Official Returns of Electrical Companies.

Yeovil Electric Light and Power Co., Ltd. (186,456).—Return dated May 25th, 1925. Capital, £10,000 in £1 shares. All shares taken up. £10,000 paid. Mortgages and charges, nil.

Sennybridge Electric Supply Co., Ltd. (174,920).—Return dated June 30th, 1924 (filed April 16th, 1925). Capital, £1,500 in £25 shares. 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

Lamp Caps, Ltd. (185,691).—Return dated July 24th, 1925. Capital, £50,000 in £1 shares. 12,000 shares taken up. £12,000 paid. Mortgages and charges, nil.

Witton-James, Ltd. (110,693).—Return dated July 27th, 1925. Capital, £6,100 in 2,000 preference and 4,000 ordinary shares of £1 each and 2,000 deferred shares of 1s. each. All shares taken up. £2,000 paid on 2,000 preference shares. £4,100 considered as paid on 4,000 ordinary and 2,000 deferred shares. Mortgages and charges at date of return, nil. Particulars filed of £25,000 debentures authorised September 1st, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

London Electric Stores, Ltd. (185,651).—Return dated February 22nd, 1924 (filed February 14th, 1925). Capital, £1,000 in £1 shares. 750 shares taken up. £750 considered as paid. Mortgages and charges, nil.

Marshall Electrical Co., Ltd. (185,795).—Return dated March 6th, 1925. Capital, £3,000 in 2,300 preference and 700 ordinary shares of £1 each. 2,300 preference and 682 ordinary shares taken up. £2,300 paid. £682 considered as paid. Mortgages and charges, nil.

R. F. Winder, Ltd.—Particulars filed of £5,000 debentures authorised June 26th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Elco Electric Manufacturing Co., Ltd.—J. P. Emett, of 18, St. Nicholas Street, Bristol, ceased to act as receiver or manager on August 14th, 1925.

Santon, Ltd.—Mortgage on 34, Bridge Street, Newport, Mon., dated August 27th, 1925, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £1,400.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

International Telephone and Telegraph Corporation.—100,000 new shares of $100 each issued at par, partly paid and fully paid. Fractional warrants to bearer.

Application has been made to the Committee to allow the following to be quoted officially:—

Ever-Ready Co. (Great Britain).—249,000 ordinary shares of £1 each, fully paid, Nos. 200,001 to 449,000, and 165,892 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 165,892.

The undermentioned have been ordered to be officially quoted:—

Shropshire, Worcestershire and Staffordshire Electric Power Co.—117,375 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 350,001 to 450,000, and 1,100,001 to 1,127,375.

Havana Electric Railway, Light and Power Co.—A plan for the readjustment of the share capitalisation of the company through the exchange of existing stock for the stock of the Havana Electric & Utilities Company has been formulated by Speyer & Co., of New York. Stockholders of the Havana Electric Railway, Light and Power Co., are offered the right of exchanging their stock for stock of the Havana Electric and Utilities Co. and cash.

Quebec Power Co.—Dividends of $1¼ per share on the common shares and $1¾ per share on the preferred shares have been declared in respect of the quarter ending September 30th.

J. G. White & Co., Ltd.—The directors announce, states the *Financial Times*, that in view of certain important negotiations which are proceeding and may materially affect the position of the company, they consider that it will be in the best interests of the shareholders to postpone the presentation of the accounts and balance-sheet for the year ended February 28th last. A formal meeting will be held to-day (September 25th) to comply with the requirements of the Companies Acts.

Shawinigan Water and Power Co.—The company has declared a dividend of $2 per share on the common shares for the quarter ending September 30th.

The directors have authorised the issue of $1,279,800 of common stock; it is offered to existing stockholders in the proportion of one new share to every 20 held.

Kaministiquia Power Co.—The company has received an offer for the sale of its undertaking to the Fort William Paper Co. The consideration is the payment of $145 per share—$95 in cash and $50 in 7½ per cent. cumulative preferred stock in a new power company to be formed. The offer is subject to the redemption of the Kaministiquia Co.'s first mortgage bonds.

International Telephone and Telegraph Corporation.—The stockholders of the Corporation have approved of the proposals to increase the company's capital to 100 million dollars and to purchase the Western Electric Company.—*Financial Times.*

Italian Company.—*The Terni Steel, Iron and Electrical Co.*—It has been decided to raise the capital of this company from 350 to 600 million lire.

Northern General Transport Co., Ltd.—An interim dividend of 2½ per cent. has been declared on the ordinary shares, as in 1924.

P. & W. Maclellan, Ltd.—An interim dividend at the rate of 6 per cent. has been declared on the 6 per cent. cumulative preference shares for the six months ended June 30th last.

Folkestone Electricity Supply Co., Ltd.—The ordinary shares are to receive a dividend at the rate of 8 per cent. per annum, free of tax, for the past half year.

Electric Supply Corporation, Ltd.—A dividend at the rate of 8 per cent. per annum, less tax, has been declared in respect of the past half year.

German Company.—*Lloyd Dynamo Works Co.*, Bremen.—The board proposes to increase the company's capital by the issue of preference shares to the value of 1,200,000 marks.

Bruce Peebles & Co., Ltd.—The directors have declared the dividend on the 7½ per cent. cumulative participating preference shares in respect of the first half of the current year.

County of London Electric Supply Co., Ltd.—The directors announce that the outstanding 5½ per cent. one-year notes are to be repaid at par on and after September 30th.

Hoffman Manufacturing Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares for the six months ended June 30th last.

Parker, Winder & Achurch, Ltd.—A dividend at the rate of 5 per cent. per annum has been declared on the ordinary shares for the first half of the current year.

Howard & Bullough, Ltd.—A quarterly dividend of 6d. per share, less tax, has been declared on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange expectation looks forward hopefully to a fall in the Bank Rate to 4 per cent. this week. If the reduction should not be made on Thursday, there will be mild disappointment, though, doubtless, the anticipation will simply be carried over for another week. Money stocks, however, are influenced by the ease that prevails in banking circles. There is substantial buying in progress of all first-class investment securities, and the effect of this is seen in a strengthening of sound investment issues of various kinds. The labour and industrial position continues to be unsatisfactory. Further falls in Home Railway stocks witness to the uneasiness of proprietors of these investments. Money realised by the sale of Home Rails is being diverted into Industrials, and in the market for the latter, noticeable activity prevails. The feature for the moment is the strength of rubber shares, in consequence of the firmness displayed by the price of the product. This latter factor lays a hand of restraint upon the buoyancy of shares in the cable construction and similar concerns, the prices of which, after their recent material advances, have shown a tendency to react.

The electricity supply market is steady, changes being few and far between. St. James's are again the outstanding feature of strength, with another rise of 5s., this taking the price

to 14¾. The shares are amongst the very few of the £5 denomination that remain in the London list, Kensingtons being the other best-known example. Lancashire Light & Power shares are easier at 26s.; otherwise, the provincial group is unchanged. The Folkestone Electricity Supply Company has declared an interim dividend of 8 per cent. per annum tax free payable on October 1st. The price of the shares is £2 middle, at which a few bargains have recently been transacted. Last year the dividend was the same, 10 per cent. tax-free being paid for the full period of twelve months. Folkestone 5 per cent. preference stand about 17s. 6d., but have not changed hands for six months. An important extension of electrical supply came into operation last week, when the Nottingham Corporation opened a new super-power generating station. This proposes to supply the city and district, and also to form a link in the general scheme of the East Midlands supply, connecting Leicester, Derby and other centres. The Midland Electric Corporation for Power Distribution is going to pay an interim dividend of 5 per cent. actual. The ordinary shares stand at 2⅛ and the 7 per cent. preference at 25s.

The County of London Electric Supply Company announces that its outstanding 5¼ per cent. one-year notes to bearer will be repaid at 100 on Wednesday, September 30th. It may be recalled that the issue of 1¼ million pounds was readily subscribed by the shareholders at 99¾ last August. There has always been a market in the notes, although, owing to their short-dated character, they were suitable, of course, only for investors who required something that was in the nature of a gilt-edged bill.

The Home Railway flatness extended into the Underground section, causing falls in Metropolitans, Districts and the three classes of the Underground Electric Railways. A campaign is on foot for the attempted restoration of confidence in Home Railway stocks, attention being called to the overdone nature of the fall in prices. This has had some slender effect in rallying quotations from the worst, but there is no escaping from the obvious fact that investment is afraid of Home Rails owing to trading and labour conditions, coupled with which is the animation shown by many Industrials, which come into sharp competition with the stocks in the senior market.

Brazilian Tractions are again amongst the liveliest stocks in the house. Momentarily the price touched 76¼, but this brought in sellers, and the Tractions subsided to 75. It is hinted that more than an expectation of an increased dividend lies at the back of the recent heavy buying, and some people in close touch with Montreal surmise that there may be buying that has for its object the obtaining of control of the company. Amongst other foreign issues, Tokio Electric Sixes are dull at 89, in consequence of the latest fire that has occurred in the Japanese city. Indian electrical issues are also inclined to be heavy, Tata Power 7½ per cent. "B" debenture changing hands the other day at 92. River Plate Electricity ordinary came to market at 202. Most of the dollar stocks are strong, Pennsylvania Water and Power capital stock, for instance, showing a rise of 10 points at 165. The Shawinigan Water and Power Company is about to make an offer of common stock at par on the basis of one share for each 20 shares now held. The whole of the money will be called up at once. As the price of the existing shares stands at 167½, the value of the rights is substantial.

The Electric Supply Corporation has declared an interim dividend at the rate of 8 per cent. per annum, less tax, the same as that of a year ago, and the price of the shares remains at 31s. 3d. Electric Constructions are better at 32s., showing a gain of 1s. 6d., and British Aluminium recovered to 1¾.

Cable manufacturing shares, as already noticed, are slightly easier, for which the rise in the price of raw rubber is again assigned as the reason. Siemens at 29s. 6d., India Rubber at 21s. 3d., Johnson & Phillips at 48s. 9d., and Callenders at 3¼ are all a trifle lower. General Electrics and Henleys have not moved. British Electric Transformer Preference strengthened to their par price of 20s. Babcocks are steady at 2⅞, though the iron and steel group is disposed to yield ground in consequence of the depression prevailing in trade circles.

Amongst cable stocks and shares, the Eastern group remains placid, Eastern ordinary, with a point decline, being the only member to exhibit any change. Indo-Europeans are £1 higher. Great Northerns strengthened to 32¾, part of the demand being attributed to Copenhagen. Direct Spanish remain at 9; the interim dividend is again to be 4 per cent., free of tax. The company's 10 per cent. preference are quoted at 7½; both classes are of £5 each. United River Plate Telephones have gone back a trifle.

Marconis hold their rise to 28s. 9d. Main interest in wireless shares is transferred, for the time being, to Canadian Marconis. The price of these has gone up to 6s. 3d., and is being industriously "talked" still better. Marconi debenture rose to 104. The wireless market has come to life again; it is showing more vitality than it has done for months past. But the liveliest section amongst industrials is that devoted to rubber shares. There, the business at present afoot is, to quote one broker's statement, absurdly enormous.

Share List of Electrical Companies

Home Electricity Companies

	Nom. £	Dividend. 1923.	1924.	Price Sept. 21, 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅞	—	*5 14 2
Charing Cross Ordinary	1	14½	15	10/-	—	6 2 5
do. do. 4½ Pref ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/-	—	5 10 4
County of London	1	15	15	57/-	—	5 5 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅜	—	5 18 8
Lancs. Light and Power	1	7½	7½	26/-	— 6d.	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5⅛	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	23/3	—	6 0 6
do. 5% Pref. ...	1	5	5	18/9	—	5 5 8
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	1⅛	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14⅜	+ ⅛	6 1 9
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref. ...	1	7	7	1⅜	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 6
do. 6% Pref. ...	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

Home Rails.

Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	66	—1	7 11 6
do. District	,,	3½	3½	42½	—1	8 6 8
Underground Electric Ordinary	10	Nil	Nil	2½	— ½	Nil
do. do. "A" ...	1/-	Nil	Nil	6/6	—6d.	Nil
do. do. Income	Bonds	6	6	95	—1	*6 6 4

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	108½	—	5 15 11
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	8	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5⅜	—	*4 8 11
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8 2
Eastern Extension	10	10	10	17⅛	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	171½	—1	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17⅞	—	*5 12 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	35⅞	+ ½	6 15 4
Indo-European	25	7	8½	42½	+1	*5 3 5
Marconi	1	10	10	1⅝	—	6 19 2
Marconi Marine	1	10	7½	⅞	— 9d.	8 11 6
Oriental Telephone Ord. ...	1	12	12	2⅛	—	*5 16 4
United R. Plate Tel.	5	8	8	7⅞	—⅛	5 4 11
Western Telegraph	10	10	10	16⅛	—	*6 3 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	8 3 9
do. do. 2nd Pref. ...	5	6	6	8⅜	—	8 17 10
do. do. 5% Deb. ...	Stock	5	5	7⅛	—	6 10 9
British Electric Traction Ord. ...	,,	6	6	120	+2½	5 0 0
do. do. 6% Pref. ...	,,	6	6	107	+2	5 12 2
Brazil Traction	100	4	4	75	+1½	5 6 8
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	88½	—	5 11 9
do. do. Preferred	,,	90/-	90/-	89½	+1	*5 6 5
do. do. Deferred	,,	129/6	129/6	109½	—	*5 18 3
do. do. Deb.	,,	4¼	4¼	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	+1	8 0 0
Mexican Light Common ...	100	Nil	Nil	3/	—	Nil
do. Pref.	100	Nil	Nil	£5	—	Nil
do. 1st Bonds ...	—	5	5	75½	+5	6 12 5
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2⅛	—	*4 16 0
British Aluminium Ord.	1	5	10	1¾	+ ⅛	5 14 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3⅛	—	4 12 4
Brush Ord.	1	10	10	1⅛	—	8 17 10
Callenders	1	15	15	3¼	— ⅛	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	£/-	10	10	9/-	—	4 8 11
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	32/-	+1/6	6 5 0
Enfield Cable, Pref.	1	7½	7½	1⅜	—	6 0 0
English Electric	1	5	5	18/3	—6d.	5 9 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	31/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	15	3⅜	—	4 18 6
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 0
India-Rubber	1	5	5	1⅛	— 9d.	*4 14 1
Johnson & Phillips	1	10	10	48/9	—2d.	4 2 0
Met-Vickers, Ord.	1	8	8	34/1	—	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	29/4	—6d.	5 1 8
Telegraph Construction	12	20	20	26½	— ½	4 10 0

* Dividends paid free of Income Tax.

Exports and Imports of Electrical Goods and Machinery in August, 1925.

Why the Exports Fell.

In making a study of last month's foreign trade statistics, two or three points have to be borne in mind if a true impression is to be gained. In the first place, the August Bank Holiday period naturally affected the whole of industry; then, in addition, numerous firms, particularly in the North and Midlands, were shut down for a week or more. Another thing which made an appreciable difference was the incidence of five week-ends (Saturdays and Sundays). With these facts in view, the reduction of about 5.8 per cent. which occurred in the general export total as compared with July is seen to be less than one might reasonably have expected. The exports of electrical goods in particular were in actual fact very little lower than in July if the foregoing considerations are taken into account, and when compared with the general export trade the position is seen to be favourable; the decline only amountd to about 2.5 per cent.

Probably the real criterion is August, 1924; when last month's total is put against the figure for that month, an increase of £77,872 is to be observed. While as regards the individual items in the export list, the reductions predominated, there were also one or two large increases. The principal decline, both in actual value and proportionately, occurred in the case of insulated wires and cables, which showed a fall of over 20 per cent. The only other notable decreases were shown by unenumerated electrical goods and apparatus, and telegraph and telephone instruments and apparatus. The increases included a rise of £54,895, or over 27 per cent., in the value of unenumerated electrical machinery; one of £14,491 (71 per cent.) in meters and instruments; and one of £12,313 (32 per cent.) in glow lamps. The chief increases as compared with August, 1924, occurred in the cases of glow lamps, batteries and accumulators, unenumerated electrical machinery, railway and tramway motors, and submarine telegraph and telephone cable. The only important decreases occurred in the items insulated wires and cables and non-submarine telegraph and telephone wires and cable.

The import list is a tale of increases as compared with the previous month's figures and also in comparison with those of August, 1924. Thus, the increase in the total is well distributed, only two items reaching above the £10,000 mark, *viz.*, batteries and accumulators and unenumerated electrical machinery. The only two decreases occurred in the items meters and instruments, and switchboards (not telegraph or telephone).

In the re-export section, which is not of very large dimensions, there was a drastic reduction, the July total being almost halved, although the figure was not far below the August, 1924, total. The reduction was general, although three increases occurred, the most important one being connected with glow lamps.

It will be observed that the increases in all three sections for the first eight months of the year are in the neighbourhood of twice the August totals, the export increase being rather less than this amount. The actual increase in the value of exports as compared with the first eight months of 1924 is 20 per cent.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.	Electrical imports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.	Electrical re-exports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.
Electrical goods and apparatus (unenumerated)	£140,121	− £18,353	− £6,208	£89,533	+ £64	+ £9,767	£5,285	− £1,472	+ £541
Insulated wires and cables ...	155,821	− 44,943	− 30,078	39,678	+ 6,612	+ 3,715	114	− 1,467	− 284
Glow lamps	50,484	+ 12,313	− 31,908	41,852	+ 2,407	+ 26,703	733	+ 603	+ 157
Arc lamps and parts	736	+ 438	− 148	638	+ 359	− 115	62	+ 57	+ 42
Batteries and accumulators ...	83,984	− 3,791	+ 27,680	56,952	+ 10,896	+ 33,490	517	− 1,360	+ 279
Meters and instruments ...	34,759	+ 14,491	+ 1,016	28,356	− 579	+ 11,761	705	− 193	+ 531
Carbons	4,693	+ 3,793	+ 1,465	8,785	+ 2,265	+ 5,230	23	− 97	− 102
Electrical Machinery—									
Electrical machinery (unenumerated)	253,576	+ 54,895	+ 93,605	106,132	+ 12,731	+ 25,094	4,203	− 683	− 1,138
Railway and tramway motors	54,719	+ 855	+ 26,458	—	—	—	—	—	—
Other motors and generators ...	180,111	− 3,143	− 8,739	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,933	− 2,182	+ 1,913	3	− 157	− 3	—	− 187	− 7
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	40,987	− 262	− 71,188	14,851	+ 3,154	+ 841	347	+ 29	+ 87
Submarine telegraph and telephone cable	39,730	− 9,917	+ 19,546	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	220,516	− 37,775	− 9,358	43,624	+ 8,164	− 10,658	3,080	− 7,832	− 572
Totals	£1,266,170	− £33,581	+ £77,872	£430,404	+ £45,916	+ £105,827	£15,069	− £12,602	− £466
Increases for the eight months ended August, 1925	Exports. £2,027,536			Imports. £845,539			Re-exports. £42,697		

The Electrical Imports of New Zealand.

THE following table shows the values of electrical and allied goods imported into New Zealand in 1924, according to the recently-issued official trade returns. The figures for 1923 have been given for purposes of comparison, and notes of increases or decreases added:—

	1923. £	1924. £	Inc. or dec. £
Electric batteries and cells—			
Total	88,000	81,000	− 7,000
From United Kingdom ...	23,000	18,000	− 5,000
,, United States	49,000	59,000	+ 10,000
,, Canada	—	2,000	+ 2,000
,, Denmark	2,000	1,000	− 1,000
Generators, motors and transformers—			
Total	352,000	525,000	+ 173,000
From United Kingdom ...	221,000	334,000	+ 113,000
,, United States	94,000	119,000	+ 25,000
,, Sweden	10,000	23,000	+ 13,000
,, Canada	11,000	10,000	− 1,000
,, Belgium	8,000	12,000	+ 4,000

	1923. £	1924. £	Inc. or dec. £
Insulated cable and wire—			
Total	460,000	666,000	+ 206,000
From United Kingdom ...	325,000	615,000	+ 290,000
,, United States	17,000	7,000	− 10,000
,, Canada	14,000	21,000	+ 7,000
,, Australia	13,000	16,000	+ 3,000
Electric lamps (incandescent filament)—			
Total	85,000	106,000	+ 21,000
From United Kingdom ...	55,000	67,000	+ 12,000
,, Netherlands	21,000	23,000	+ 2,000
,, United States	6,000	10,000	+ 4,000
Other electric lamps—			
Total	12,000	33,000	+ 21,000
From United Kingdom ...	2,000	5,000	+ 3,000
,, United States	8,000	25,000	+ 17,000
Carbons in blocks—			
Total	34,000	38,000	+ 4,000
From United Kingdom ...	15,000	26,000	+ 11,000
,, United States	11,000	10,000	− 1,000
,, Australia	1,000	1,500	+ 500
,, Canada	6,000	1,000	− 5,000
Cooking and heating appliances—			
Total	*	14,000	—
From United Kingdom ...	*	3,000	—
,, Canada	*	10,000	—
,, United States	*	1,000	—
Telegraph material and apparatus—			
Total	*	48,000	—
From United Kingdom ...	*	19,000	—
,, United States	*	14,000	—
,, Belgium	*	13,000	—
Telephones and accessories—			
Total	239,000	88,000	− 151,000
From United Kingdom ...	56,000	28,000	− 28,000
,, United States	44,000	22,000	− 22,000
,, Sweden	1,000	5,000	+ 4,000
,, Belgium	34,000	27,000	− 7,000
Other electrical material—			
Total	419,000	546,000	+ 127,000
From United Kingdom ...	223,000	344,000	+ 121,000
,, United States	148,000	152,000	+ 4,000
,, Japan	1,000	—	− 1,000
,, Australia	8,000	10,000	+ 2,000
,, Canada	31,000	25,000	− 6,000
Electricity meters—			
Total	44,000	64,000	+ 20,000
From United Kingdom ...	39,000	60,000	+ 21,000
,, Holland	—	1,000	+ 1,000
,, United States	2,000	1,000	− 1,000
Recording and testing instruments for meters—			
Total	51,000	57,000	+ 6,000
From United Kingdom ...	37,000	34,000	− 3,000
,, United States	11,000	16,000	+ 5,000
Iron telegraph and telephone wire—			
Total	12,000	*	—
From United Kingdom ...	12,000	*	—
Gas, oil, and hot-air engines, exceeding 100 b.h.p.—			
Total	15,000	19,000	+ 4,000
From United Kingdom ...	13,000	19,000	+ 6,000
,, Sweden	1,000	—	− 1,000
Steam engines, stationary, exceeding 200 b.h.p.—			
Total (all from U. Kingdom)	16,000	3,000	− 13,000
Turbines, steam and water, and Pelton wheels, exceeding 200 b.h.p.—			
Total	89,000	32,000	− 57,000
From United Kingdom ...	83,000	29,000	− 54,000
,, Switzerland	2,000	—	− 2,000
,, Sweden	4,000	3,000	− 1,000

* Not specified.

Electricity Supply in Germany.—Herr W. Majerczik, of Charlottenburg, is advocating the introduction of a uniform system of production and distribution of energy by the Reich Government, as he says that only under such a system will it be possible to get a cheap supply of energy. Not only Prussia, but also the States of Bavaria, Wurtemberg, Baden, Saxony and Thuringia, in recent years have begun to develop the production and distribution of energy, while various provinces, such as Brandenburg, Pomerania, and East Prussia, have also embarked on the same path, and to these have to be added the numerous communal works both of a private nature and those under joint proprietorship. An electrical map of the present time is said to resemble the political map of the Middle Ages, when there were hundreds of large and small States, for there are now thousands of supply undertakings with areas overlapping one another. It is argued that out of this state of chaos it is necessary to bring order, and apart from about a dozen of the largest towns all the other works should be consolidated under a uniform Reich undertaking.

Canadian Electrical Notes.

(By Our Special Correspondent.)

THE Provincial Government of Ontario has recently published a pamphlet bearing the title "List of Water Powers in the Province of Ontario." The greater part of this pamphlet consists of a tabulation giving the names of the various rivers on which power is available; the district in which the drainage area lies; the actual power sites; the available head in feet; the estimated capacity in horse-power at 80 per cent. efficiency, both at ordinary minimum flow and at ordinary six months' flow, and the present installed horse-power, if any. For the last three items the totals are given for each individual river.

In the foreword it is pointed out that "High accuracy in the estimate of water power requires continuous stream flow records over a long period of time, and as such long-term records are available for only comparatively few of the rivers of the Province, many of the estimates are subject to revision as more is learned of the run-off characteristics. Nevertheless, the estimates will give a fairly close approximation of the power possibilities of the Province and serve as a starting point for the more detailed study of individual sites."

In the introductory text preceding the tabulation referred to above, the following table is given:—

TABLE I.—AVAILABLE AND INSTALLED WATER POWER IN ONTARIO.

Drainage Basin.	Estimated Capacity in H.P. at 80% efficiency. At ordinary minimum flow.	At ordinary six-months' flow.	Installed H.P.
Hudson Bay ...	26,759	53,513	—
James Bay	525,862	950,982	117,085
Lake Winnipeg ...	199,944	328,696	36,645
Lake Superior ...	180,787	303,822	90,600
Lake Huron	221,502	413,000	168,993
Lake Erie	3,292	8,923	11,367
Lake Ontario ...	1,054,935	1,101,060	1,030,705
St. Lawrence River	791,308	956,561	17,671
Ottawa River ...	423,763	708,986	112,267
Totals	3,429,152	4,825,143	1,585,333

It is stated that the totals of available power shown above "include only the amount of power in the Niagara River, which is equivalent to the diversion of water permitted by treaty." There is little doubt that before long application will be made to Ottawa and Washington respectively for permission to divert considerably more water for power purposes from the Niagara River than is allowed by the present treaty. If the total power possibilities of the Niagara River were made available for development, the provincial totals would rise to some 5,330,000 h.p. at ordinary minimum flow and 6,940,000 h.p. at ordinary six-months' flow. That there is plenty of scope for the installation of hydro-electric plant in Ontario yet may be seen from the statement that studies have indicated that throughout Canada generally installed power is about 30 per cent. greater than the corresponding six-months' power. On this basis, therefore, the water-power resources of Ontario would permit of an installation of 6,270,000 h.p. or, if the total potential power of the Niagara River is included, an installation of 9,000,000 h.p. The water-power resources of the Province may thus be said to be from 18 to 25 per cent. developed. The estimated water powers are in all cases on the basis of continuous twenty-four-hour power.

There is no doubt that owing to some of the water powers of Ontario being situated in uninhabited, and in some cases decidedly inhospitable, regions, it will be long before all of them are utilised, but fortunately a very considerable proportion of the available power is located in the St. Lawrence and Ottawa River basins and on Lake Ontario, where use can be made of it as the need arises.

There has recently been developed in Canada a new electric furnace process for the manufacture of sodium sulphide, a paper on which subject was read at the Dominion Convention of Chemists which was held at the beginning of June. This paper is reported in full in *Canadian Chemistry and Metallurgy*, but, unfortunately, no electrical data whatever are given. The account is very interesting, however, as another instance of the industrial application of electricity. The Canada Carbide Company is now advertising sodium sulphide of a purity of 85 per cent., which is much higher than was attainable by former processes, and in the development of this process some extraordinary difficulties had to be overcome as the substance is liquid at a relatively low temperature but solid and extremely refractory at higher temperatures (*i.e.*, above 1,000 deg. C.). At the lower temperature it was not possible to obtain the substance above about 60 per cent. purity. The research leading up to the development of the process on a commercial basis was carried out under the auspices of the (Canadian) Honorary Council for Scientific and Industrial Research. The manufacturing development was undertaken by the Canada Carbide Company at Shawinigan Falls. Sodium sulphide is largely used as a solvent for sulphur dyes: it is employed as a depilatory for hides and as a sheep dip; and it has other minor uses such as in the precipitation of silver and the regeneration of cyanide in mining operations.

The Wireless Exhibition, 1925.

An All-British Display of Radio-Telephone Apparatus and Accessories.

(*Continued from page* 450.)

British L. M. Ericsson Manufacturing Co., Ltd.

In addition to numerous examples of its well-known telephones and loud-speakers, this company displayed a number of receiving sets. One of these, a miniature crystal set, is illustrated in fig. 11. As will be seen, this is of an extremely compact nature, and it is only about two inches in diameter. The rectangular knob on the left is for the adjustment of the crystal, while the centre knob bears the cat's-whisker. The tuning knob on the right-hand side of the set operates a slider upon a tapped inductance. The aerial and earth terminals are diametrically opposite on the side of the case. A four-valve set (fig. 12) was shown in various combinations

Fig. 11.—The Ericsson Miniature Crystal Set.

(enclosed panel and cabinet forms). This has a tuned anode circuit and two power valves. Each valve is provided with a dual filament resistance to enable either bright or dull emitters to be employed. A wave-trap is incorporated, but this is easily disconnected when not required. A switching arrangement to permit of the use of two, three, or four valves is provided.

Fig. 12.—An Ericsson 4-Valve Set.

A notable feature of these four-valve sets is that the panel is of wood—oak, mahogany, or walnut. This is quite as suitable as ebonite if, as in these sets, the spindle holes are bushed with good insulating material. One of the cabinets shown was an excellent piece of workmanship and incorporated every convenience for radio work. The exhibit also included numerous components.

Edison Swan Electric Co., Ltd.

Being a valve manufacturer, the company has added to its series since the last exhibition, and amongst the bright types the "A.R." is specially made for h.f. and l.f. work, the distinguishing marking being a red or green lines respectively along the bulb from the cap to the tip. Another interesting point about the company's valves is the new method of sealing which ensures that the purchaser receives an absolutely new valve; the device consists of a glass tube fitted over the anode pin, to which it is attached by means of a sealed thread. Amongst the array of Ediswan sets and components we were interested in a new two-valve receiver (fig. 13) which the company is just placing on the market. Its circuit consists of a detector and one l.f. stage with reaction and it is claimed that excellent loud speaker results are obtained up to 25 miles and with headphones stations over 100 miles away are received well. The set is of a circular pattern in moulded insulating material, the valves being mounted close together on a central raised pillar, the l.f. transformer and connections being inside the pillar. All controls are arranged radially from the central pillar, a flat type condenser being contained in the base; the filament is arranged for dual control so that either bright or dull emitter valves may be used, and the coils are of the plug-in type. Another interesting item is the intermediate stage coupler for super-heterodyne circuits. It contains the coupling

Fig. 13.—Circular Ediswan 2-valve Receiver.

transformers and a filter circuit, suitably spaced and mounted on a common spindle, all connections being made to terminals on the two longest edges of the base. The long-range radiophone is a four-valve set of the reflex type, and sets finished in a variety of styles in Chinese lacquer are shown with supporting tables and loud speakers to match. The company has introduced a high-pressure accumulator (fig. 14), the units of which have been specially designed for the purpose. Other exhibits were dry h.p. batteries, dry batteries for use with dull-emitter valves, and headphones.

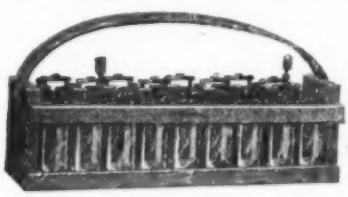


Fig. 14.—New Ediswan H.P. Accumulator.

C. A. Vandervell & Co., Ltd.

This display stand consisted chiefly of components. The whole of the movement of the "C.A.V." crystal detector was shown mounted in a moulded circular base 1¾ in. in diameter and enclosed in a glass case 2¾ in. high. A hornless type of loud speaker has been designed for those requiring an instrument to harmonise with the furnishings of a room. It is encased in a polished mahogany cabinet measuring only 15¼ in. long, 9¼ in. wide and 9 in. high. The filament resistance, fig. 15, is of an unconventional type; it is mounted on spring supports, its length behind the panel being 3 in., and the resistance is made to revolve with the rotating helical contactor. An interesting multiple fixed condenser is shown in fig. 16; by combining several condensers in one case, with convenient

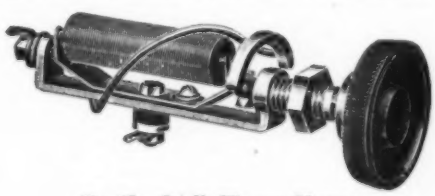


Fig. 15.—C.A.V. Filament Rheostat.

Fig. 16.—C.A.V. Multiple Fixed Condenser.

tapping points, it is possible to obtain any required capacity value within the stated limits by simply connecting the tappings in parallel. The component is totally enclosed in an ebonite casing, and screened from stray capacity effects; its overall height is 2¼ in. and length 2¼ in. Attention has been paid to the production of a tuning inductance which combines mechanical strength, small losses, and a pleasing appearance. C.A.V. tuning coils, fig. 17, for the broadcast range, are wound with bare copper wire, 22 s.w.g., air spaced on special formers, and are protected by a strong casing. As a further refinement, the block carrying the plug and socket is cut away to reduce the capacity between the metal portions, and all the coils are 4 in. in diameter by 1 in. wide. The company's valve holder sockets are constructed of helical springs kept at the correct tension by means of an absorbent cushion ring which method ensures contact and prevents the transmis-

Fig. 17. C.A.V. Tuning Coil.

sion of vibration or shock to the valve. The moulded casing is slotted between the metal portion in order to reduce inter-socket capacity. A gramophone attachment, various patterns of transformers, and h.p. and l.p accumulators, were also on view, including a combined set, the assembly of which comprises two separately crated H.T.2 sets, giving a total of 120 volts, and a 6 E.L.5, 6-volt, 50-amp.-hr. (actual) l.p. ebonite accumulator, all encased in a polished rosewood container. The specially shaped hinged lid exposes the plates of front cells to view and permits easy inspection of all connections. Valve protection is afforded by a fused connecting link between the two h.p. groups, which also serves for testing each two-volt cell. Feed wires enter the back of the container, the dimensions of which are 25 in. by 13 in. by 8½ in. in height, handles and clips projecting.

Sun Electrical Co., Ltd.

Upon this stand were displayed examples of the products of numerous radio apparatus manufacturers. Receiving sets of the leading makes were shown in great variety, one of the principal being an "Acme" 7-valve super-heterodyne receiver with a single-knob control. All kinds of components were exhibited, and the accessories included a wide range of loud speakers, telephones, valves, and batteries.

Alfred Graham & Co.

The well-known "Amplion" products were shown in the centre of the main hall, and as last year demonstrations were given "under home conditions" at a special depôt in Kensington Palace Mansions near by, representative ranges of loud-speaker models being on view at both places, including the "Dragon" and "Junior" types. Recent constructional improvements were described in our pages last month.

A notable innovation, first shown at the Exhibition, was the new series of "Radiolux Amplions." The "Radiolux" is

Fig. 18.—The "Radiolux Amplion," Model RS20.

an apparently hornless cabinet loud-speaker, of which one pattern is illustrated in fig. 18 herewith; it somewhat resembles a bracket clock in shape and size, and is made in two patterns, with five cabinet styles, all of very handsome appearance. In place of the usual horn, there is an acoustic duct, bent as shown in figs. 19 and 20, so as to occupy the minimum space,

and passing through the wall of a reflecting bowl; the mouth of the duct faces the specially shaped bottom of the bowl, which has a flaring mouth (fig. 20). The electromagnetic system has a threaded nozzle, which screws into a rubber brush in the small end of the duct below a perforated supporting plate; the plate and the whole of the acoustic system are insulated from the cabinet by rubber washers, and every care is

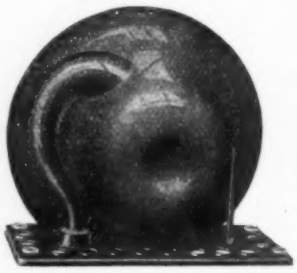


Fig. 19.—Acoustic System from the Rear.

Fig. 20.—Front View of Bowl.

taken to avoid the presence of unwanted resonance. The electromagnetic system is of new design, the rear plate carrying the whole of the mechanism, the adjusting device, and the terminals, which are of a patented spring type. The grille seen in fig. 18 is bulged, for acoustic reasons, and the effect is very pleasing. It is claimed that the new type gives great volume of sound with purity of tone and absence of objectionable resonance.

The new "Swan-Neck" type of Amplion was also exhibited.

Metro-Vick Supplies, Ltd.

Among a number of receiving sets shown by this company was a new 3-valve set of very novel construction. This departs entirely from the usual lines, and in this way becomes a set of small dimensions. Resistance-capacity coupling is employed; this, it is claimed, ensures distortionless amplification of speech and music. The operation of the set is simplified by its only having two controls—a main tuning condenser with vernier adjustment and a variable reactance coil. A dual rheostat, a battery switch, and spring valve holders are incorporated. The coil units cover wavelength ranges of from 230 to 550 metres and from 1,300 to 3,000 metres with an average aerial. The two control knobs are so arranged that by half a turn contact is broken—thus the set can be left ready for operation at any time on any particular station without fear that the set will be switched on accidentally. A dust-proof cover of dark red moulded composition can be supplied with this set. The cover has a flat top upon which a loud-speaker can be placed. The compact "Cosmos" crystal set, described in our issue of August 28th (p. 356), was also exhibited. This, it will be remembered, has condenser tuning and arrangements for receiving the high-power station. It can be hung up on a wall if required. Other exhibits were a new low-loss, slow-motion condenser, valves, rheostats, potentiometers, and the "Cosmos" strip inductance coil. The last is put up in a highly-polished moulded casing rendering it impervious to moisture.

Radio Communication Co., Ltd.

A competition was arranged by the Radio Communication Company in connection with a display of window-dressing designs. Two lady artists engaged on the staff of the company arranged 12 alternative displays in a special window, which were changed sufficiently frequently to cover each of the twelve selected displays daily. Those wishing to enter the competition were to place on a form provided for the purpose the twelve displays in what they considered to be their relative order of merit, and those who most nearly selected the order decided by the voting in the competition were to receive prizes of £25, £15, and £10 respectively. The competition was open to all visitors to the Exhibition, whether engaged in the trade or not.

(To be continued.)

Trade with Turkey.—The September *Journal* of the British Chamber of Commerce of Turkey contains an article upon British trade in Turkey. It deals mainly with methods of business, stating that there are four salient points to be borne in mind in dealing with this market, *viz.*, that cheapness, not quality, is required; that the requirements of the market are to be considered instead of the market being offered unsuitable goods; that competition is very great; and that competitors grant credit. A brief summary is given of the methods employed by competitors to secure Turkish business; among these are mentioned personal visits by manufacturers, the appointment of reliable agents, regular visits by travellers, facilities in shipment and delivery, and equal attention to both large and small orders. It is said that although Turkey is at present a small market, the country is developing and likely to become an increasingly good customer for many years to come.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Improved Electric Soldering Iron.

The accompanying illustration, fig. 1, is of an electric soldering iron which is marketed by MESSRS. MAY & PADMORE, LTD., Wharfedale Road, Tyseley, Birmingham. The hot-forged copper point is specially shaped to reach places which are difficult of access, while the overall diameter is such that it easily permits the operator to "get at" the connections. It can be connected to an ordinary lamp socket.

Fig. 1.—The Maymore Soldering Iron.

A Field Mule Pack Radio Set.

MESSRS. STUART TURNER, LTD., 43-47, Market Place, Henley-on-Thames, have recently designed and built for the War Office a special petrol-driven generating set, fig. 2, for mule transport for wireless signalling in the field. The set comprises an air-cooled engine and a direct coupled dynamo mounted on a tubular frame for carriage by a pack mule. The engine is of the twin-cylinder opposed type, air cooled, 1,760 r.p.m. The cylinders are of cast-iron with side-by-side valves and detachable heads. The flywheel acts as a centrifugal fan and is surrounded by an aluminium case conducting the air on to the cylinders to cool them. The crankshaft runs on ball bearings and is machined from the solid. The connecting rods have roller bearing big ends with 18 rollers in each, and the gudgeon pin bushes are of bronze. The pistons are aluminium with three cast-iron rings, the gudgeon pins being of the floating type. The camshaft runs on ball bearings and is driven by a gear wheel; it operates the valves by means of tappets. The magneto is driven at half the engine speed by a gear wheel from the camshaft. The governor and oil pump are operated by a shaft, skew driven by the crankshaft. The carburettor is of the patent Stuart design whereby the correct admixture of air and petrol is obtained at all throttle openings. The petrol tank is fitted with a special valve by which the vent hole in the filler cap is closed when the petrol supply is shut off so that it may be carried in any position. At the same time the petrol is not turned on until the vent hole is open. The silencer receives the exhaust from both cylinders and is fitted with an exit pipe to which can easily be attached a flexible exhaust pipe for conveying the exhaust right away from the set. Starting is effected by a handle operating an epicyclic gear with dogs engaging the end of the crankshaft. The gear gives a 3 to 1 increase for starting. The dynamo, made by Newtons, Derby, is direct driven by a flexible fabric coupling and has two outputs generated simultaneously—1,200 V, .08 A, and 12 V, 8.0 A. The framing is of steel tubing completely covering the outside dimensions of the set to provide some protection whilst carried on the pack animal. The set weighs 84 lb. and its dimensions are, length 2 ft. 7 in., width 1 ft. 6 in., height 1 ft. 3 in.

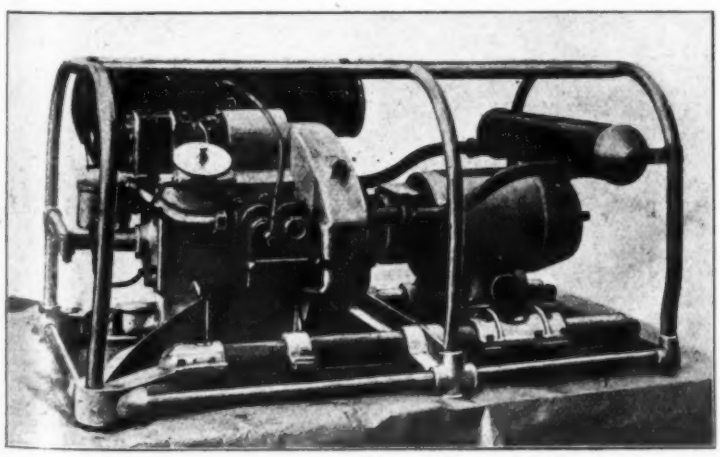


Fig. 2.—The Turner Field Radio Equipment.

The "Crescent" Dish-washer.

In our recent report on the Bakers' Exhibition at the Agricultural Hall we mentioned that the HOBART MANUFACTURING CO., LTD., Charterhouse Street, E.C.1, included in its display a "Crescent" dish-washing machine. This appliance, which is illustrated in fig 3, contains a rack into which the plates and dishes are inserted. They are then subjected to numerous jets of hot water from a revolving sprayer. After this cleansing operation, water from stationary sprays is projected on to the ware, rinsing it clean. The model illustrated has a height of 56½ in., and it is 27 in. long and 28½ in. wide; it is capable of dealing with from two to three thousand pieces per hour.

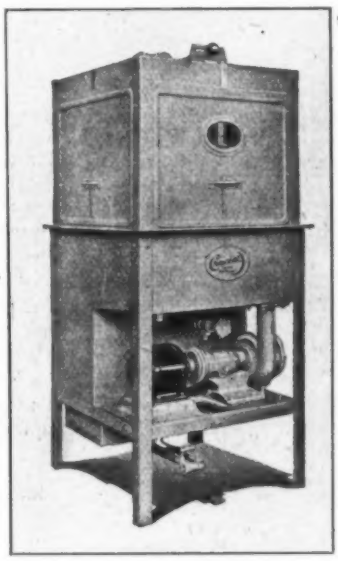
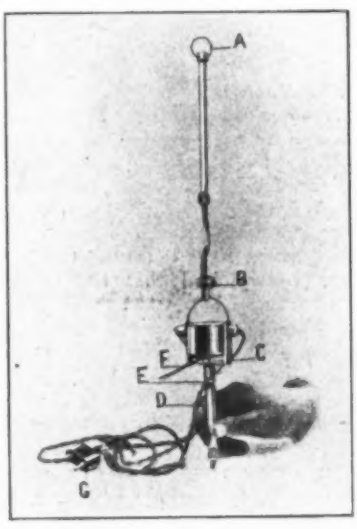


Fig. 3.—The "Crescent" Dish-washer.

An Electric Drawing Copying Machine.

An interesting electrical apparatus by which copies of drawings may be made by perforation on paper, cloth, wood, glass, &c., has recently been put on the market by M. R. LEBESCHE, of Vevey, Switzerland. The device (fig. 4) which can be operated from any electric light circuit, comprises an electro-magnet adapted to give an alternating magnetic field so causing a small disk to vibrate, the vibrations being converted into a rapid to and fro motion of a needle which pierces a series of small holes in the drawing to be copied. The original is then placed over another sheet of wood or glass, on which it is desired to produce the copy of the drawing which is done by spreading a special coloured powder over the original; the powder in passing through the perforations giving an exact and sharp copy of the original.



A. Suspension hook.
B. Adjustable support for varying height.
C. Needle working in conjunction with vibrator.
D. Tube adjusting length of perforating needle.
E. Needle adjustment lock nut.
F. Speed regulator.
G. Connection plug to electric circuit.

Fig. 4.—An Electrical Copying Machine.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

THE second annual conference of the Institution of Public Lighting Engineers took place on September 14th, 15th and 16th at Leeds, and was attended by some 200 members, ladies, and friends directly or indirectly connected with the public lighting profession.

The business meetings were held in the Philosophical Hall, Park Row. On the evening of September 14th, the visitors were entertained to an "At Home" and civic reception at the City Art Gallery by the Rt. Hon. the Lord Mayor of Leeds (Councillor C. G. Gibson) and the Lady Mayoress; afterwards they were conveyed by motor coaches on an hour's tour of the main features of the Leeds lighting system, under the guidance of Mr. C. S. Shapley, Leeds city gas engineer and head of the Street Lighting Department, and various members of the staff. A special feature of the tour was the fact that a considerable number of street sections had been fitted with various manufacturers' lamps and other fittings, both electrical and gas, to show in actual and normal use (not specially-arranged display lighting) appliances which were on view at an exhibition of street-lighting appliances held at the Leeds Town Hall throughout the duration of the Conference.

On September 15th the visitors were entertained to luncheon at the Town Hall as the guests of the Leeds Gas and Lighting Committees, and were subsequently taken on an enjoyable motor drive to Templenewsam and Harrogate. On the Wednesday morning, before resumption of the last business session, a wreath was deposited at the Leeds War Memorial Cenotaph by the newly-elected President of the Institution (Mr. C. S. Shapley, of Leeds), who was accompanied by members of the Council and of the Institution generally.

At the opening of the business on the 15th, the chair was occupied by the retiring president, Mr. S. B. Langlands, Lighting Superintendent of Glasgow, and the members were given an official welcome by the Lord Mayor of Leeds (Councillor C. G. Gibson), who expressed the hope that the Conference would be fruitful of benefit to the profession and through the profession to the public. Mr. Shapley, the president-elect, said the Lord Mayor was to be congratulated on the progress that had been made with public lighting in Leeds.

Mr. C. S. Shapley was then installed in the chair by Mr. Langlands, and Councillor E. J. Clarke, chairman of the Leeds Corporation Street Lighting Committee, in an address couched largely in a humorous vein, added his welcome to that of the Lord Mayor. As a layman, he recognised that lighting engineers performed not only an important public duty, but one the value of which was seldom appreciated by the public as it should be.

Thanks to the retiring President were proposed by his successor, and seconded by Mr. J. F. Colquhoun (Sheffield), both speakers pointing out that Mr. Langlands had borne the brunt of presidential work by taking office in the first and probably the most difficult year. Mr. Langlands, in reply, said he was glad to see evidence of that recognition which was the due of the new Institution in the presence of Mr. R. B. Mitchell, President of the Incorporated Municipal Electrical Association; Mr. C. F. Botley, President of the Institution of Gas Engineers; and other representatives of kindred associations.

The meeting resolved unanimously to send a cablegram of greeting to the Illuminating Society of America which was in conference at the same time.

The President then delivered his address, of which an abstract will be given later.

Commenting on the address, Mr. SHAPLEY said public lighting had immensely improved in recent years, but there was still plenty of room for further improvement. The address was illustrated by a number of lantern slides, showing both electric and gas lighting in Leeds; and by a very large map, erected in a wooden frame across a corner of the room, which when lighted up from behind, with the lights of the room extinguished, was seen to have been punched with holes to represent all the street lamps in the major portion of the Leeds lighting system. The map showed how congested was the population, and the need for adequate lighting, in the industrial aras, and how population became much more sparse some two miles from the centre of the city. The Leeds lighting department, Mr. Shapley pointed out, for a population of some 470,000, had to light 587 miles of streets, which was about sixty miles more than in the case of Glasgow, though the population of Glasgow was much greater. By the pasting of coloured paper behind the map, the electric lighting of Leeds streets was shown by red lights, high-pressure gas by green lights, and low-pressure gas by ordinary white lights. Mr. Shapley spoke of a certain wet roadway and a point policeman who had been nearly knocked down by motorists six times. That policeman was on duty on a well-lighted road, in a white coat. Mr. Shapley made a test and found that, owing to the sheen of the road, the policeman was much better visible, even at night, in his blue uniform than in the white coat. Turning to the question of lamps for marking danger points, Mr. Shapley strongly urged lighting engineers not to overdo the number of these, or they would reduce their value seriously. In consultation with the Chief Constable of Leeds, he had found that in 587 miles of lighted streets and roads there were only 40 points at which a danger lamp was really justifiable. Mr. Shapley asked members to bear in mind that the paper had been written two months before the Conference, and that some points might need a little modification in view of recent lighting developments as seen in the exhibition at the Town Hall.

The thanks of the meeting were accorded to the president for his address, after which Mr. Edward C. Lennox, in order to leave more time for discussion on the next day, read his paper, which was on the programme for the final day, the subject being "Electric Street Lighting in Rural Areas."

Mr. Lennox, like the president, observed that since preparing the paper the development of lighting progress had been such that there were already one or two points on which, if he were writing the paper again, he would make some modifications.

The PRESIDENT proposed a vote of thanks to Mr. Lennox for his paper, and said he had been particularly struck by the excellent design of overhead transmission cabling network, and its neatness.

Councillor H. F. A. EDMONDS, vice-chairman of the Camberwell Works Committee, seconded the vote and endorsed the admiration of the neat network.

Mr. C. F. BOTLEY, president of the Institution of Gas Engineers, congratulated the Institution of Public Lighting Engineers on its valuable work in bringing gas and electrical men together to further the common interests of better public lighting. He thanked the Institution for electing as its second president Mr. Shapley, a member of the Council of his own Institution. Many of the points given by Mr. Lennox he could confirm from his own experience. He felt that the reader of the paper was a thorough master of his subject.

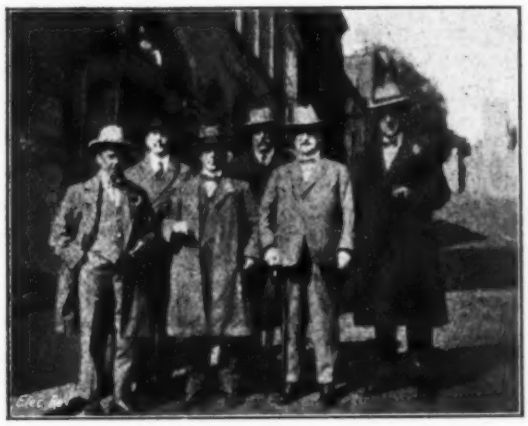
Mr. R. B. MITCHELL, president of the Incorporated Municipal Electrical Association, said he fully endorsed the remarks of Mr. Botley, and particularly emphasised the value of the two great industries of gas and electricity working together in the public lighting service. He paid a tribute to the excellent address given by the president, and offered his best wishes to the Institution for its future work.

(To be continued.)

The Municipal Tramways Association—II.

Annual Conference at Brighton.

On Thursday, September 10th, Mr. Dalrymple's paper on "Tramway Stopping Places" was discussed, and a paper by Ald. R. A. Smithson, chairman of the Leeds City Tramways Committee, on "Tramway Finance" was read and discussed. In the afternoon the general meeting, reported in our last issue, was held, and in the evening the annual dinner of the Association took place at the Hotel Metropole. Ald. C. Higham presided over a gathering of about 400. Proposing "The Municipal Tramways Association," the Mayor of Blackburn, Councillor J. Stanworth, thanked the Mayor of Brighton, the chairman of the Brighton Tramways Committee, and Mr. W. Marsh, engineer and manager of the tramways, for the excellent arrangements that had been made. He paid a tribute to the work of the general secretary, Mr. J. Beckett, and said that the keen competition that they met with must be countered with a cheaper, quicker, and more comfortable service. Ald. Higham responded, claiming that transportation was a public service that ought to be in the hands of the local authorities, but ought not to be used to make a profit and relieve the rates. Mr. P. Priestley, President-elect, proposed the "Corporation of Brighton and the Tramways Committee," and the Mayor of Brighton responded; the toast of "The Visitors" was proposed by Mr. W. Chamberlain, general manager of the Leeds tramways, Mr. Marshall Harriss, general manager of the Dublin United Tramways Co., responding.



A Group of well-known Members.

Leaving Arundel Castle.

The dinner was followed by an informal dance, which was very enjoyable.

Friday, September 11th, was devoted to tours in the adjoining country. The weather was delightful, and a motor-coach trip during the morning through Worthing to Arundel, where the castle and grounds were open for inspection, was thoroughly enjoyed. In the afternoon there was a circular motor-coach tour through Tunbridge Wells and East Grinstead, the two journeys taking the company through much of the most delightful scenery in Sussex.

The Royal Pavilion was thrown open in the evening on the occasion of a reception by the Mayor and Mayoress of Brighton, and the dance which followed was attended by a large number of members and friends.

The Conference was considered to be a most successful one, the attendance being a record.

Municipal Tramways and Motor Omnibuses.

DISCUSSION.

Councillor J. PEACH (Chairman, Northampton Tramways Committee) proposed a vote of thanks to Mr. Fearnley for his paper. Councillor D. W. BEATON (Chairman, Aberdeen Tramways Committee), who seconded, said that the municipalities would have to adopt the determined attitude outlined in the paper. They had been compelled to municipalise the supply of gas, water and electricity, and the transport service was no less important than any of those three. Councillor J. H. WHITTAKER (Chairman, Todmorden Tramway Committee) urged the necessity for co-operation between the municipal tramway authorities in connection with the provision of services as connecting links between their various tramway systems. If the local authorities did not, either jointly or individually, provide such services, they could not reasonably object to private enterprise being allowed to provide them.

Councillor F. BURT (Sub-Convener, Glasgow Corporation Tramways Committee) said he was a thorough tramway man, but considered that the tramway undertakings wanted some brushing up. The tramway departments were inclined to look upon themselves as being the ultimate end of everything in the way of street transport. The public did not travel by tramcar instead of the 'bus because of the lower fares on the tramway, but they preferred the 'bus because of its higher speed. He suggested the use of single-deck cars, because the present-day double-deck monstrosities could not run along a country road at high speed. He also suggested sidings in parts of the city, where the slow cars could deposit passengers and allow the fast cars to pass.

Mr. H. MATTINSON (General Manager, Manchester Corporation Tramways) said it must be acknowledged that the companies were here, and had a field of operation which could never be handed over to the municipalities. On the other hand, municipal transport officers, and their committees, claimed, and would insist upon, their right to provide transport facilities within their spheres of influence, which were not necessarily limited to their particular boundaries. The solution of the competition problem was for the Association to promote a Bill to bring about adequate laws to regulate the motor transport of the country, both public and private enterprise; there should be an adoptive Act. He saw no reason for despondency with regard to competition, and had not the slightest doubt that the tramway was *the* instrument and that there was nothing even remotely likely to oust it from its position as the prime mover of the public.

Mr. C. J. SPENCER (Honorary Member) said the street transport problem was how to carry the maximum number of people in the shortest possible time at certain times of the day, and the vehicle which would do that most satisfactorily was the one with the largest capacity, within reason. He criticised Mr. Fearnley's figures, which showed that in 1919 the cost per seat provided on a motor 'bus was 114.1 per cent. more than the cost per seat on a tramcar, whereas for the four months ended July 18th, 1925, the difference was only 27 per cent. The 'bus did not pay towards road maintenance a sum commensurate with the damage it caused; the tramways were contributing large sums to the maintenance of the roads used by their competitors, and the Association, by allowing that to go on, helped their competitors in no small measure. The way out of the present difficulties was to develop tramways more. Referring to the common talk that the public preferred the 'bus to the tramcar, he said recent statistics showed that, when tramcars and 'buses were operating at the same fares on the same route, the average passenger took the vehicle that came first.

Alderman T. WOFFENDEN (Deputy Chairman, Huddersfield Tramways Committee) said that every municipality should have powers to enter into through-running agreements, and those powers could only be obtained by co-operative action between all municipalities, led by the Association. The small councils which were now refusing to give municipal tramway authorities permission to go through their districts would, in time, have to develop, and if the powers referred to were not obtained by the municipalities, those small councils would have to buy the existing undertakings and would have to pay for the neglect of to-day.

Councillor J. G. FRAZER (Chairman, Dundee Tramway Committee), referring to the lack of efficiency of municipal tramways, pointed out that the managers were subject to municipal and political expedience.

Councillor V. L. MCENTEE (Chairman, Walthamstow Tramways Committee) said that efficiency and publicity was the keynote of success in the future, and suggested that the local

Press in the various districts might be used by tramway authorities for publicity purposes.

Mr. J. S. D. MOFFET (General Manager, Salford Corporation Tramways) said he would not hesitate to recommend the scrapping of tramways if he could find something better, but for certain classes of traffic he did not think there was anything better. Speeding up the tramcars had its limits, because the convenience of the public must be studied, and higher speed might defeat the object of the tramway authorities in connection with the short-distance traffic. The tramcar was the most efficient vehicle for the door-to-door or street-to-street traffic, but at present there was nothing but the motor 'bus for the non-stop or limited non-stop type of service for carrying passengers outside the towns. He urged the Association to find some general clause which could be inserted in general Acts, giving municipalities running powers outside their boundaries.

Mr. W. MURRAY (Manager, Walthamstow U.D.C. Tramways) criticised the Association for its lack of vision with regard to motor 'bus competition. The Association had demanded equality of opportunity, but that was no use. The peculiar thing was that, whilst the Association was asking for equal opportunities, those in power were willing to give more. Sir Henry Maybury (Head of the Roads Department of the Ministry of Transport) had said that Parliament was going to protect the tramways, whilst a Departmental Committee of the Ministry, dealing with this question, in its interim report, had recommended that the licensing authority should have power to limit the number of licences issued and to revise them where an adequate and satisfactory service of suitable vehicles was already being given. He recommended that the Association should revise its attitude and policy, because equal opportunity would not save the tramways.

Mr. R. S. PILCHER (General Manager, Edinburgh Corporation Tramways) said that if 'buses were allowed to compete over the long distances, it would not be long before they would compete in the centres of the cities for the short-distance traffic. Comparing the 'bus with the tramcar, he said the modern 'bus was commodious, well lit, well sprung, it ran on pneumatic tires, and had all the latest appliances on it. On the other hand, many tramway systems had plant which was 25 years old. Appealing for higher speed, he said the cars at Edinburgh ran at 24 m.p.h. on the level, but that was not the limit, because the cars were fitted with 50 h.p. motors. It was his intention to apply to the Ministry of Transport for permission to run at a higher speed still. Finally, he urged the scrapping of old equipment.

Councillor A. STARK (Member of the Hull Tramway Committee) said it was no use attempting to fight motor transport; it was up to the municipalities to own and control it. As to speed, it was not so much a question of speeding up the tramcars as of preventing the 'buses exceeding the speed limit, because a safe speed limit for any city was a speed which any municipal tramcar could do easily.

Councillor S. F. JOHNSON (Chairman, Southend-on-Sea Tramways Committee) agreed that the 'buses could not be fought altogether, and that in many districts they were fulfilling a public need because the municipal tramways were not allowed to do it. If the trams were scrapped, 'bus fares would eventually go up, and it seemed to him that the cry for the scrapping of the trams was raised in order to put the 'bus companies in a better financial position in the future. When the 'buses had had as long a life as the tramways, unless they put by a good deal for depreciation, they would meet with the same difficulties as the tramway undertakings were meeting.

Alderman R. T. FLETCHER (Chairman, Wigan Tramways Committee) suggested that the title of the Association should be "The Municipal Transport Association," because the last word was not spoken when they had dealt with tramways.

Alderman W. C. FENTON, J.P. (Deputy Chairman, Sheffield Tramways Committee) said that when the new Ministries were instituted, the municipalities lost a lot of their local authority; with the disappearance of the Local Government Board they lost a certain amount of local autonomy, which they should regain. He disagreed that all the tramway concerns had shown lack of vision; with an astute, far-seeing and energetic manager, and a sympathetic and enterprising tramway committee, they could do a great deal more than they were doing.

Mr. FEARNLEY, replying to the discussion, said it rested with the municipal tramway authorities to see that the ideal of public service was properly catered for and carried out. The proposed joint board for the working of the tramway systems in the fringe towns of Lancashire and Yorkshire was a great idea, and should be pushed for all it was worth. The opinion that the public would ultimately support the system which gave the best service was certainly sound. It was not true that the present double-deck tramcars could not be speeded up. The single-decker was not the solution of the problem; it had been tried out in many towns, including Sheffield, where the Corporation had been glad to get rid of them to tramway companies at a very low price. As to competition, if the 'buses would keep to the sphere left to them after the municipal tramways had covered the sphere outlined in the paper, the latter would keep to theirs and be satisfied. The 'bus could take the place of the tram only if the tramway men allowed it. Mr. Fearnley submitted that the 78-seater tramcar did not provide the comfortable accommodation which the modern 'bus provided. The latest type of tramcar must be compared with the latest type of 'bus, and that was done in the paper. As to obtaining powers to run omnibuses without the necessity for going to Parliament, these powers could be obtained if the 98 municipalities represented by the Association made up their minds to get them. It was the intention of the paper to show that it was the competing vehicle which was making the most progress, and that it was necessary for tramways to make more progress. They must be quietened, brightened and painted. Mr. Murray had said that London had been up against the difficulty of competition for years; if that were so, why had not the London area moved and helped itself? The whole of the London local authorities had operated in splendid isolation, and that had in a great measure brought about the position in which they found themselves to-day. If the London municipal areas had demanded with one voice, 15 or 20 years ago, the right to operate motor 'buses in connection with their tramways, would not they have got it?

As to the suggestion by Councillor Stark that the speed of motor 'buses should be restricted, that was absolutely the wrong way to deal with the matter. The tramways did not want to pull the other people back, but to beat them. He did not think Parliament would decide which system would survive as the local passenger system; the public would do that. Although Alderman Fletcher had said that the Committees had moved with the times, yet he had three systems of transport in Wigan. He (Mr. Fearnley) would ask those who had three systems to think over the question: "Can anything but the motor 'bus hold the motor 'bus?" That was the crux of the whole matter.

Tramcar Stopping Places.

By JAS. DALRYMPLE, C.B.E.

(*Abstract.*)

If we are to compete successfully with the motor omnibus, we must tighten up our schedules, and one way to do this is undoubtedly to abolish some of our car stops. I have got some valuable information from a number of managers regarding the number of stopping places on their respective systems. On some systems the average distance between stops is given as 160 yards, and on others the figure is as high as 400 yards. I would like, very soon, to go more particularly into this question with the managers who can successfully operate a city tramway system with an average distance between stops of 400 yards. Speaking generally, I think that for many years the tendency has been to increase the number of stopping places. Tramway committees and managers are continuously receiving requests for additional stops.

In Glasgow this question of increased speeds has only come to the front during the past six months, and it has been raised solely on account of the speed of the omnibuses running in competition with the cars. Six months ago the average distance between stops was 184 yards. In rearranging the stops we endeavoured to have not more than four stops for each fare stage, the average length of the fare stage being about 1,200 yards. This, however, could not be rigidly adhered to, especially in the central areas. Altogether we were able to abolish about 600 stops, and the average distance between stops is now about 240 yards instead of 184 yards. It is not possible to say exactly what effect the abolition of stops has had on the schedule speeds. There is no doubt, however, that it has been considerable. On one route we increased the average speed by on-and-a-half m.p.h.—one mile of this was an actual increase of speed and the remaining half-mile was the result of having fewer stops.

The present average speed may be stated as:—

From depôt to depôt, 8.56 m.p.h.; from terminus to terminus, including lie-over, 8.86 m.p.h.; and from terminus to terminus, excluding lie-over, 9.20 m.p.h.

The alteration in speed has meant practically an increase of one mile per hour; and this increase of one mile per hour has been made possible partly by the abolition of 600 stopping places. One very striking result of this increased schedule speed has been to release 70 cars from service. I do not know that we have always fully appreciated the full effect of even a slight increase in schedule speed. I think it is generally admitted that the only advantage the motor omnibus has over the tramcar is in the matter of speed, and even this advantage can only be got by the driver of the omnibus breaking the law.

You are, no doubt, aware that we have had in Glasgow a by-law in operation since 1912 which reads as follows:—

"When a tramway car is standing at a tramway stopping place, as such stopping place is indicated by a notice on the side of the street, every driver of a vehicle who intends to pass on the left or near side of such car shall draw up immediately before arriving at such stopping place until the roadway is clear of passengers entering or leaving such car."

It is now very seldom that the driver of a vehicle of any description attempts to pass between a car which is standing at a stopping place and the footpath when any person is boarding or leaving the car. The by-law has been carried out to the entire satisfaction, not only of the drivers and motorists, but also of the Tramways Department and the travelling public. I am also satisfied that this by-law, as administered in Glasgow, has the unqualified approval of the police, the Automobile Association and the carting contractors in the City. So far as I can ascertain, no section of the community would approve of this by-law being rescinded. The operation of the by-law works with perfect smoothness, and I have never heard it suggested that it causes the slightest unnecessary obstruction. There is no doubt that many lives must have been saved through the operation of the powers conferred by this by-law.

Discussion.

Alderman CAPTAIN D. CRICHTON (chairman, Belfast Tramways Committee), who proposed a vote of thanks to Mr. Dalrymple, said that the way to make tramway systems efficient and keep them up-to-date was to act on such solid advice as that given in the paper. In the matter of tramcar stops, some

people were most unreasonable, and his view was that in all matters the advice of the manager should be taken.

Mr. H. MATTINSON (general manager, Manchester Corporation Tramways), who seconded, said that no hard and fast rule could be laid down, but he had found that eight stops per mile on roads which had no distinguished features was quite practicable. This gave a reasonable distance to enable the car to accelerate, and not an unreasonable distance for the public to walk. It was almost a revelation to imagine that, merely by the adjustment of stops, 70 cars could be removed from the service, if that could be done without detriment to the service.

Mr. E. H. RAYNER (general manager, Hull Corporation Tramways) said that one of the outstanding features of the paper was the value of studying small things; managers often overlooked the value of seconds and minutes. Ten per cent. on the speed made a tremendous difference to expenditure. The great trouble was the congestion of the streets with unnecessary traffic, and efforts must be directed to controlling it. That was the only way in which to get full advantage of all the improvements introduced into the tramway systems.

Mr. J. K. BRUCE (general manager, L.C.C. Tramways) said that in 1912 the average speed on the L.C.C. tramways was 8.44 m.p.h. The average speed to-day was 9.6 m.p.h.—the fastest speed, he believed, of any urban tramways in the country. The result had been to retain the goodwill of the public, and to enable a bigger service to be run without additional cars. By increasing the speed from 8.44 to 9.6 m.p.h., 230 cars were saved, representing about £700,000 (present prices). The average distance between stopping places was now 220 yards, which distance, having regard to all the circumstances, approximated to the 240 yards in Glasgow. If, on his system, the time lost at stopping places could be reduced on the average by one second, a further saving of approximately £20,000 a year in operating expenses could be effected. By the use of high-power motors, which enabled the car to get quickly into its stride again after stopping, other traffic which would get back on to the track again through the car stopping had not the time to do so, and the car was delayed less in traffic, thus effecting further saving.

Mr. W. V. MORLAND (manager, St. Helens Corporation Tramways) expressed the opinion that, as rolling stock 25 years old was still in operation on some systems, it would be madness to increase the speed of many cars without providing a new system of braking. There was far too much physical effort incurred in the stopping of tramcars, even with present speeds, owing to the use of the old type of hand-brake. In many cases speeding up would involve the adoption of the air system of braking with track shoes.

Councillor W. J. ARMSTRONG (Leeds Tramways Committee) suggested that it was possible to give practically the same service with greater speed, and yet to maintain practically all the existing stopping places, by letting each alternate car stop at alternate stopping places, so cutting down the number of stops made by each car. The stopping places could be marked with various colours, and the cars which stopped at those places could bear a similar coloured sign. He hoped that the Executive Council of the Association would continue its efforts to prevent other traffic passing standing tramcars, and that those interested in tramways would do their best to educate public opinion against that practice.

Mr. W. MURRAY (general manager, Walthamstow U.D.C. Tramways) uttered a warning against speeding up, and thereby reducing working costs, at too big a sacrifice. He asked Mr. Dalrymple whether, if he had three or four motor-'buses running for every tramcar he put on the road, he would persist in cutting out his stopping places. The conditions of operation of a tramcar and a 'bus were so vastly different that they could not both be dealt with in the same way, but a great deal of time might be saved on the tramways by more alertness on the part of the conductors in starting cars.

Mr. DALRYMPLE, replying to the discussion, said he believed that the reduction of stopping places had had no effect on either the number of passengers or the revenue; if it had had any effect at all, it had increased both the number of passengers and the revenue. The public were insisting upon speed, and if they did not get it, the tramways would lose business! He was satisfied that, whatever took place in the tramway world, the cars must be speeded up, and that could be done in the simplest possible way by eliminating stops. He agreed that some cars were not built for speed, and that, in order to get it, the equipment must be changed; that would involve a great deal of expense, but it would be absolutely necessary if tramways were to continue as the means of street locomotion through cities.

Opening of the North Wilford Station.

MANY features of interest marked the proceedings at the opening, on September 17th, of the first section of the Nottingham Corporation's new super-power station at North Wilford. The Mayor, in opening the proceedings, confessed that since the first generating station was opened locally Nottingham had not progressed with the times with regard to electrical developments. Now, however, they would be able to supply, not only the city, but 17 urban districts in the vicinity, covering a total area of 47 square miles. Alderman Huntsman then set in motion the No. 1 turbine, and, subsequent to a tour of inspection of the works, the company was entertained to luncheon. The chair was occupied by Alderman Huntsman. The toast of the "Mayor and Corporation was proposed by Alderman W. Walker, of Manchester, who expressed the hope that the new station would be the means of substantially aiding Nottingham's industries; the Mayor acknowledged the toast.

Sir John Snell proposed "Success to the Nottingham Electricity Undertaking," recalling the fact that it was in Nottingham that the Commissioners held their first inquiry. He was confident, seeing that to-day they were selling only some 80 kWh of electricity per head of the population, that there was a very big expansion of business before them. He hoped that the Corporation would follow up its enterprise by a bold policy of low tariffs, which would attract new consumers. With regard to the new works, he desired to pay a tribute to his old friend, the consulting engineer, Mr. J. H. Rider. No doubt they had hoped he would be able to say something about the Government's electricity proposals, but he must disappoint them on that score. He could say, without indiscretion, that the North Wilford station, situate in proximity to an important coalfield and upon the principal waterway of that part of the Midlands, was in such a strategic position that, given the willingness of the Nottingham Corporation to extend it as might be required, it would become one of the largest stations in the country.

Preceding Alderman Huntsman's reply, a presentation was made to him by his *confrères* on the Nottingham Corporation Electricity Committee of a silver electric lamp, a rose bowl being also given to him which had been subscribed for by members of the East Midland Electricity Industrial Council (No. 7 Area) and the East Midland Electricity Joint Board, together with the engineers and other employés of the several undertakings, as a token of their appreciation of his valuable services.

In reply to the toast of the consulting engineers, which was proposed by the Town Clerk (Mr. W. J. Board), Mr. J. H. Rider emphasised the consideration that the new station would reduce in a very substantial measure the cost of generating electricity in Nottingham. The old stations ought to have been scrapped 20 years ago. Had the Nottingham output last year been generated at North Wilford, it would have meant a saving of £50,000 on coal alone. Whilst he did not know the price at which the Nottingham authorities would dispose of electricity, he advised them to encourage new industries by selling power at rock bottom rates. These might, at the moment, appear to be below cost, but a bigger load would bring the cost down right away, and everyone would benefit from a larger output. When the new machine to be ordered within a week or two was installed and they produced another 20,000 kW, the cost would come down again and Nottingham would attain the premier position among electrical undertakings in that area. On behalf of his firm Mr. Rider presented a loving cup to Alderman Huntsman, whose work and that of the Committee he eulogised.

The toast of "The Visitors" was acknowledged by the Mayor of Leicester, and Mr. Geo. Balfour, M.P., that of "The Contractors," which was proposed by Major W. E. Walker, vice-chairman of the Electricity Committee, being responded to by Mr. J. P. Gregory (of the British Thomson-Houston Co., Ltd.) and Mr. H. J. S. Mackay (of the Stirling Boiler Co., Ltd.).

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Rural Electricity Supply.

Your work on behalf of rural electrification deserves the thanks of all who are interested in the increased use of electricity. Those of us who have done what we can by speaking, writing, and by making ourselves a nuisance to the Post Office officials, and even to the Electricity Commissioners' staff, know how valuable the publicity you give to these matters will be in securing relief from our position as the most regulated industry in the world. A railway company may run express trains through a countryside within the enclosure of a mere rail fence; canals often have no fences; rivers never have them. The sea, the cliffs, the sidewalks are unrailed, and gas has its carbon monoxide content increased, and no one troubles. Suicides may kill themselves in any way they like, except by electricity. This is the one public utility service which must be regulated and hampered to its detriment, while the politicians tell us everyone must use electricity if the country is to be saved from ruin. Even the Electricity Commissioners are liable to think that regulations are more important than rural lines. Their personal experiences have been confined to work in cities and densely populated areas, and they cannot be expected to see our difficulties unless they are forced under their notice.

Mr. Borlase Matthews asks: "What does it cost to tap a power line—say, at 33,000 volts"? The answer is: "Tell me what precautions I have to take and I will tell you how much it will cost." There are no regulations dealing with the subject, but I understand some busybodies have their eyes on this one bright patch and are burning to draw up some more regulations.

The Mid-Cheshire Electricity Supply Company, which has a primary distribution system at 33,000 volts, can and does tap

its lines—protected by oil-break switchgear between it and the source of supply—at a cost (single-phase) of under £60, excluding land and the transformer, using an air-break switch and horn-break fuses. Our newer tappings will cost less than that. Repeated negotiations with manufacturers have produced a single-phase transformer as small as 25 kVA at a cost of £75 to £85, according to the low-pressure voltage. Smaller sizes are as yet tendered for with reluctance, and the cost is almost the same. Three-phase tappings and transformers cost about 33 per cent. more, but three-phase lines are too expensive for rural work. A single-phase 3,300-volt tapping and transformer of 5 kVA costs only £30.

We await permission to try a single-phase, 3,300-volt, single-wire line with earth return, and the longer this experiment is delayed the longer the villager and farmer will have to wait for their cheap and abundant supply of electricity. With the single-phase earth return line we can go to farm, village, and mansion, at 3,300 volts, but with 2-wire lines we can only take farms, &c., *en route* to large villages and mansions. Until we are freed from the shackles of over-regulation and the blight of the "Post Office" we cannot reach the purely farming areas on a commercial basis.

It is often presumed that the Post Office, being a Government Department, has a prior right to the use of the air and the earth, and that any other user must obey its orders. This is incorrect, and it is the duty of every distribution engineer to resist the monstrous and increasing claims of the Post Office, which, in fact, has no power to dictate. The Electricity Acts prescribe arbitration in all cases of difference, and concerted action should be taken to enforce the rights of electricity undertakers. The smaller undertakings cannot afford to fight this battle by themselves. The power companies will, it is hoped, see that the increased use of extra-high-pressure lines is hampered if every paltry interconnecting telephone circuit is to be kept overhead and the power line broken and carried underneath, or carried over on steel towers and guarded with heavy rod cradles at a cost of £250 per crossing in the case of 33,000 volts. The Post Office can, and do, put their lines underground when they wish; for instance, in cities and when leading into exchanges. Their talk of speech efficiency limits is a device to save themselves trouble—regardless of the enormous expense their refusal imposes on other utility undertakers, and therefore upon the users of electricity. If the Post Office trunk and interconnecting lines are so near the speech limit that a few yards of underground line will make them unusable, the sooner they are improved the better for the community.

A few cases like the famous Liverpool case will demonstrate the Post Office to be no more privileged than other public utility undertakings.

W. Fennell.
General Manager and Engineer.

Mid-Cheshire E.S. Co., Ltd.,
Northwich, *September 17th*, 1925.

The Roman Baths at Bath.

On August 7th last we published in the ELECTRICAL REVIEW (supplement p. 11) an advertisement in which we drew a moral from the durability of the lead used by the Romans sixteen or seventeen centuries ago in the famous Roman baths at Bath.

We are pleased to note from your issue of this week (page xxxiii) that this advertisement has been paid the tribute of the sincerest form of flattery.

For the benefit of any others who may wish to use this particular idea, we may say that we have been courteously informed by the baths director at Bath of an error in our statement regarding the thickness of the sheet of Roman lead used for the floor of the bath.

We stated that this sheet of lead was ¼ in. thick, but the director informs us that it is actually 1¼ in. thick. Naturally this fact does not affect the cogency of our argument in any way, but in the interests of archæological accuracy we think it well to draw attention to it.

Johnson & Phillips, Ltd.
CHARLES STEWART, *Director.*

Charlton, *September 18th*, 1925.

Current Literature.

I would like to suggest to you that it might be of considerable interest to your readers if you would publish weekly a digest of current literature on electrical and allied engineering subjects. You will probably know that this is done by the *Electrical World*, and also by the *Revue Générale de l'Electricité*, and I think that if you adopted a similar scheme it would be very much appreciated.

The *R.G.E.* prints the weekly digest on one side of the page only, the back being devoted to advertisements. This allows one to cut out any reference of particular personal interest, and paste it on to an index card.

If you are at all doubtful whether the scheme would be successful, I would suggest that you invite your readers' opinions on the subject.

P. Gilman Ashley, B.Sc.

Jarrow, *September 9th*, 1925.

[We are obliged to our correspondent for his suggestion. The matter has been considered from time to time, but is not so simple as it might appear to be.—EDS. ELEC. REV.]

Technical Training in Nigeria.

The art of teaching is not often appreciated outside a school. I had found my station engineer a resourceful man during the start-up of this plant, and here is his way of instructing the native shiftman.

One alternator was running on the system, controlled by the voltage regulator, when a dead short tripped the main circuit-breaker, and the machine voltage soared upward. The chief at once took the regulator off, and Sam asked, in due course, "Why?" The answer came pat:—

"Busbar speak to Regulator, he say: 'We want more volts.' Regulator, he speak to Alternator, say, 'He give more volts.' Alternator he agree."

"When voltage be right, Busbar he tell Regulator 'finish.' Regulator tell Alternator 'finish.'

"But when that switch (*i.e.*, the main C.B.), he be out, Busbar no fit speak to Regulator. Regulator he no savvy what to do, so he tell Alternator 'more volt.' Alternator no savvy, he keep giving volts until *you* put Regulator switch off."

Sam said, "I savvy, Sir," and proved it by doing it himself next time.

Such men keep stations running.

John F. Shipley.

Kwall Hydro-electric Plant, W. Nigeria,
August 24th, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

20,025. "Microphonic transmitters." E. A. Graham. June 4th, 1924. (238,585.)

1924.

4,818. "Protective arrangements for a polyphase alternating electric current circuits and the like." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. February 2nd, 1924. (238,911.)

10,386. "Circuits for electron discharge tubes." Western Electric Co., Ltd. May 16th, 1923. (216,114.)

10,407. "Automatic telegraph devices." F. McKay. April 28th, 1924. (238,932.)

12,886. "Thermionic tubes or valves." C. Seymour, H. G. Hughes, and H. R. Cant lo. May 26th, 1924. (238,934.)

13,054. "Brakes for tramway vehicles." M. A. Blanchard. May 28th, 1924. (238,950.)

13,067. "Metal-clad electric switchgear." A. Reyrolle & Co., Ltd., F. Coates, and H. W. Clothier. May 28th, 1924. (238,951.)

13,068. "Metal-clad electric switchgear." A. Reyrolle & Co., Ltd., H. W. Clothier, and A. Allan. May 28th, 1924. (238,952.)

13,149. "Electrolytic process and apparatus." G. B. Ellis. May 28th, 1924. (Roessler & Hasslacher Chemical Co.). (238,956.)

13,253. "Electrochemical treatment of copper ores." H. S. Mackay. May 29th, 1924. (238,962.)

13,312. "Electric fuse boxes." A. Reyrolle & Co., Ltd., and H. W. Clothier. May 30th, 1924. (238,963.)

13,313. "Electric wall plugs and like fittings." A. Reyrolle & Co., Ltd., H. W. Clothier, and H. F. Secretan. May 30th, 1924. (238,964.)

13,329. "Submarine signalling systems." Western Electric Co., Ltd. June 30th, 1923. (218,261.)

13,333. "Leading-in means for wireless telegraphy and telephony." J. E. Fairlie. May 30th, 1924. (238,965.)

13,676. "Indicating or switching device actuated by the movement of a rotary member." English Electric Co., Ltd., and H. J. Few. June 4th, 1924. (238,972.)

15,224. "Crystal detectors for wireless receiving sets." L. Grossman. June 24th, 1924. (238,975.)

15,310. "Holders for electric lamps." H. Marryat and R. G. Williams. June 25th, 1924. (238,997.)

16,062. "Variometers for wireless circuits and the like." W. Joughin and T. Hough. July 4th, 1924. (239,002.)

16,585. "Tuning coils used in wireless telegraphy and telephony." G. Turner. July 10th, 1924. (239,007.)

17,089. "Keyboard telegraph machines." D. Murray. July 17th, 1924. (239,011.)

18,974. "Vacuum electric tube amplifying apparatus." A. S. Cachemaille (Westinghouse Electric & Manufacturing Co.). August 9th, 1924. (239,029.)

19,083. "Electrical commutators or distributors." A. L. Isaac. August 11th, 1924. (239,031.)

19,475. "Oil-break switches." Sachsenwerk Licht-Und Kraft Akt. Ges. October 23rd, 1923. (Patent of addition not granted.) (223,674.)

20,438. "Telephone systems." Western Electric Co., Ltd. October 24th, 1923. (223,877.)

21,195. "Sparking plug." T. W. Warren. September 8th, 1924. (239,049.)

21,940. "Electrical relays." J. J. Rathbone. September 17th, 1924. (239,053.)

22,515. "Imitation candle lamps." W. Griffin. September 24th, 1924. (239,058.)

23,807. "Electric intermittent switches." F. W. Sturgess. October 8th, 1924. (239,066.)

24,489. "Photo-electric devices." British Thomson-Houston Co., Ltd. November 13th, 1923. (224,874.)

25,554. "Variable electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (239,072.)

25,869. "Electrical condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 29th, 1924. (239,073.)

26,921. "Electric furnaces." M. Gjersoe. November 12th, 1923. (224,895.)

27,131. "Armatures for electric dynamos, motors, and like machinery." C. A. McEldowney. November 13th, 1924. (239,076.)

1925.

537. "Thermionic valves." E. Hatann. January 11th, 1924. (227,452.)

3,025. "Grid for electron discharge tubes." E. Schrack. February 3rd, 1925. (239,110.)

5,345. "Buffing and draw gear for railway, tramway, and like vehicles." A. Spencer. February 26th, 1925. (Addition to 204,181.) (239,118.)

5,918. "Thermionic valves." A. E. Beattie. March 4th, 1925. (239,121.)

7,352. "Electric insulation-testing devices." H. Michel. March 20th, 1924. (231,473.)

8,671. "Means for clamping together electric transformer coils." T. Maier. April 1st, 1925. (239,132.)

13,594. "Electric regulating systems." British Thomson-Houston Co., Ltd. August 18th, 1924. (238,513.)